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American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

⁂

PHILIP DOWELL, Editor

RALPH CURTISS BENEDICT, Associate Editor

VOLUME I

PORT RICHMOND, N. Y.
1911

CONTENTS

No. 1, issued 16 August 1910

Foreword 1
Notes on the botrychia (Plate 1) . . . . L. S. HOPKINS 3
Polypodium vulgare in Maine . . . . HENRY W. MERRILL 7
Fern leaves, ferns, and fern allies . . . . R. C. BENEDICT 9
Notes on some ferns found during 1909 . . . . PHILIP DOWELL 12
Lycopodium inundatum in the White Mountains M. A. MARSHALL 15
Of interest to fern students 16

No. 2, issued 30 December 1910

Fern collecting in Southern California . . . . F. T. PEMBER 17
Polypodium vulgare in Great Britain . . . CHAS. T. DRUERY 19
A new hybrid fern . . . . E. J. WINSLOW 22
Dryopteris filix-mas × marginalis produced in cultivation R. C. BENEDICT 24
Polypodium vulgare L. var. auritum Willd. . . . F. G. FLOYD 25
Items for members 28

No. 3, for January, issued 13 February 1911

On the genus Dryopteris . . . . CARL CHRISTENSEN 33
Notes on Southern California ferns . . . . C. C. KINGMAN 37
A new Cuban fern (Plate 2) . . . . R. C. BENEDICT 40
Ferns of the Transvaal [a review] . . . . R. C. BENEDICT 44
A fern collector in Florida . . . . F. T. PEMBER 45
Fern notes from the South . . . . E. L. LEE 49
A collecting trip in southern Florida JOHN DONNELL SMITH 51
On the study of ferns . . . . PHILIP DOWELL 53
Notes on ferns attacked by a leaf roller . . . . . PHILIP DOWELL 58
Ferns at home, and visiting (Plate 3) . . . KATE D. SPALDING 60
Notes and news 63

No. 4, for April, issued 3 May 1911

The Pteridophyta of the arctic regions . CARL CHRISTENSEN 65
A new Antrophyum from Luzon (Plate 4) . . R. C. BENEDICT 71
Fern collecting in Cuba . . . . ELIZABETH G. BRITTON 75
New stations for Dryopteris Goldiana × marginalis in Vermont . . . . EZRA BRAINERD 78

Asplenium acrostichoides Sw. .... E. J. WINSLOW 79

Some Southern California ferns ...... GEORGE L. MOXLEY 82

Notes on the gray polypody .... STAFFORD C. EDWARDS 83

Review: THE FERNS OF MT. APO .... R. C. BENEDICT 83

Additions to the herbarium .... L. S. HOPKINS 85

Notes and news 89

No. 5, for July, issued 7 August 1911

The tropical American species of Dryopteris subgenus Eudryopteris .... CARL CHRISTENSEN 93

Botrychium Jenmani in Cuba .... R. C. BENEDICT 98

A new variety of the cinnamon fern .... LEWIS S. HOPKINS 100

A list of the ferns found in the vicinity of Ohio Pyle, Pa. LEWIS S. HOPKINS 101

Southern California fern notes .... GEORGE L. MOXLEY 104

The study of fossil ferns .... F. H. KNOWLTON 105

Ferns of the Isthmus of Panama .... GEORGE F. CLEVELAND 111

Cyrus Guernsey Pringle .... HAROLD GODDARD RUGG 114

The field meeting at Hartford .... E. J. WINSLOW 115

Notes and news 118

No. 6, for October, issued 29 November 1911

Notes of a naturalist afloat—I (Plate 5) WILLIAM EDWIN SAFFORD 121

Notes on the ferns of the Isle of Pines, West Indies OTTO E. JENNINGS 129

An interesting find .... HAROLD W. PRETZ 137

Lycopodium flabelliforme .... E. J. WINSLOW 141

Edward Palmer .... WILLIAM EDWIN SAFFORD 143

Grace A. Woolson .... EMILY HITCHCOCK TERRY 148

Notes and news 149

Index to volume I 151

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CONTENTS

Page
Foreword 1
Notes on the botrychia 3
Polypodium vulgare in Maine 7
Fern leaves, ferns, and fern allies 9
Notes on some ferns found during 1909 12
Lycopodium inundatum in the White Mountains . . 15
Of interest to fern students 16

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American Fern Journal

Vol. I AUGUST, 1910 No. 1

FOREWORD

About six months ago, a vote was taken to determine whether the American Fern Society was in favor of owning and publishing its official journal. The poll showed sixty in favor, ten opposed, and ten recorded as indifferent, clearly a strong sentiment in favor of a new journal.

As to the advisability of starting a new journal, there are at least two reasons for such action, from which few members can dissent. First, the probability that the present official organ may be discontinued when it has reached its twentieth volume, or even sooner, as its editor has stated more than once. If such a proceeding is imminent, it is none too soon for the Society to take action, looking toward the starting of a new journal. Secondly, it would be obviously to the advantage of the Society to control and publish its official organ, if it can do so creditably. But (without regard to these considerations,) since the Society requires a journal for its operation, and if it has the means and ability to publish for itself, why should we continue to be dependent upon a yearly contract with a privately owned journal, which contract is liable at the beginning of each year to fail of renewal? Especially when we add that the editorial pages of this privately owned journal are partly devoted to maintaining the editor's views in a controversy upon which the members of the Society are divided, or indifferent, and upon which, therefore, it is policy for the Society to remain neutral.

The undersigned believe that a large proportion of the American Fern Society are in favor of Society ownership, and that such ownership is entirely feasible.

In order to test the matter, to secure reliable data for estimating expenses, and to find out by actual experience what difficulties are to be met and what support can be relied upon; this number has been issued, the expense being shared by a few members who thus act as a voluntary committee of inquiry. If it meets with the approval and support of the members generally, it will be continued as long as support is forthcoming. Already a second issue is practically assured, and copy is plentiful.

Although the action is entirely unofficial, it is intended to make the Journal about what it would be if it were the official publication, publishing news, notes and other matter of interest to the Society, and, as seems proper for a Society paper, personalities will be tabooed, and the editorial department will take a neutral position as to any intra-society controversy. In the matter of nomenclature, each contributor may exercise his preference.

If at any time the Executive Council decides to take it up, the Journal will be turned over to the Society without any expense. In the meantime we ask your support: by contributions in any amount possible; by subscriptions for this number and the next; by suggestions.[1] A full statement of the expenses of this issue, showing what the Society could expect if it owned its journal, will be published in the next number.

(*Signed*) L. S. HOPKINS
H. E. RANSIER
E. J. WINSLOW
R. C. BENEDICT
PHILIP DOWELL
W. C. BARBOUR
NELLIE MIRICK

---

[1] **Suggestions, subscriptions, and contributions may be sent to Mr. E. J. Winslow, Lasell Seminary, Auburndale, Mass.**

NOTES ON THE BOTRYCHIA

L. S. HOPKINS

(With *Plate I*)

The fern collector who is much in the woods and fields, sooner or later is certain to have the ecological peculiarities of the various species thrust upon him. One species grows upon limestone, another in a swamp, a third on wooded hillsides, and so on throughout the list.

My attention was first called to the clannishness of the botrychia by a friend, Atty. R. J. Webb, of Garrettsville, Ohio, a very careful observer, who, under date of May 14, 1907, wrote: "The most interesting fact revealed by my studies of the botrychia is the remarkable clannishness of the species. They seem to love each other's society and where one grows the others do also.

Botrychium lanceolatum (Gmel.) Ångstr., *Botrychium virginianum* (L.) Sw., and *Botrychium obliquum* Muhl. grow within a few feet or yards of the two stations that I know for *Botrychium ramosum* (Roth.) Aschers. (*Botrychium matricariæfolium* A.Br.). At the other three stations for *Botrychium lanceolatum* (Gmel.) Ångstr., it is in company with *Botrychium virginianum* (L.) Sw. and in one or more cases with *Botrychium obliquum* Muhl."

Since then I have noted many instances of similar association of the various species of botrychia.

Near Troy, Miami Co., Ohio, a group of approximately one hundred plants was seen, including *Botrychium obliquum* Muhl., *Botrychium dissectum* Spreng., as well as several plants intermediate between the two. The plants grew in an open woods within a radius of twenty-five yards.

At Chesterland Caves, Geauga Co., Ohio, *Botrychium* *ramosum* (Roth.) Aschers. and *Botrychium lanceolatum* (Gmel.) Ångstr. were seen growing together on July 2, 1908, immediately in front of the hotel at this resort. If any of the other species of botrychia ever grew in the same spot, being larger and more conspicuous, they have been plucked up and exterminated.

Near Burton in the same county, *Botrychium dissectum* Spreng. and *Botrychium obliquum* Muhl. and its varieties (as yet undetermined) grow in a moist, sandy bottom field of four or five acres in such profusion that even a modest estimate would sound almost absurd. Fifty-six plants were counted in a space estimated at twenty feet square. They were almost as numerous in other parts of the field.

A similar grouping was noted in the fall of 1909 near Cheswick, Allegheny Co., Pa. In this instance *Botrychium dissectum* Spreng., *Botrychium obliquum* Muhl., *Botrychium obliquum* v. *oneidense* (Gilbert) Waters and a form very suggestive of the variety *tenuifolium* (Und.) Gilbert were found rather plentifully within a few yards of each other.

The probable explanation of this grouping together of these plants is to be found in the fact that they are rather exacting as to the ecological conditions under which they will grow best, and wherever these conditions obtain the plants are likely to occur rather plentifully.

Curiosity prompted the measurement of the roots of two specimens of *Botrychium virginianum* (L.) Sw. collected near Trafford City, Allegheny Co., Pa., May 28, 1910. The specimens were taken at random from a group of perhaps twenty plants of the same species. In each case a small part of the root system was probably lost since the idea of measuring the roots was not thought of until the plants were being prepared for pressing, and no special care had been used in taking them up. The combined length of the roots of one

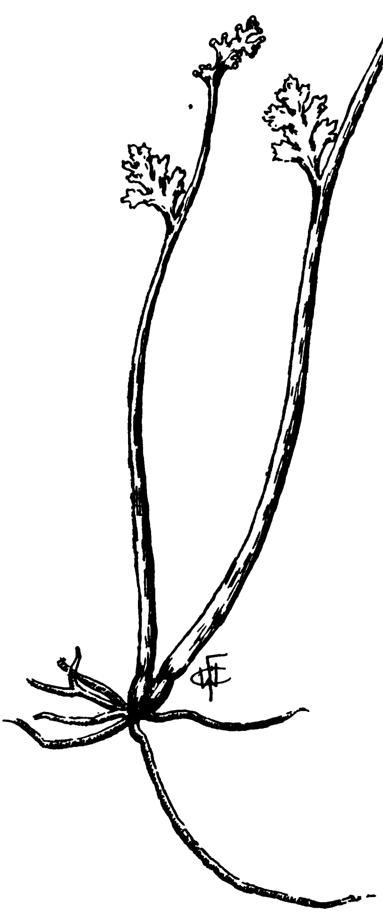

Plate I
(*About natural size*)

plant was 278 inches; of the other 312 inches. The roots were pressed and will be mounted with the plants although every one knows the roots of the botrychia are very brittle and difficult of preservation when dried.

In "The Fern Flora of Ohio" (Fern Bulletin, Jan. 1907) mention was made of the reproduction of the botrychia in some cases at least by a short thick root-stock. Since that time I have found two mature fruiting fronds of *Botrychium ramosum* (Roth.) Aschers., attached to the same rootstock as shown in *Plate I*. Also a specimen of *Botrychium obliquum* Muhl. having two sterile fronds and a bud for a third, all on the same rootstock, was found late last fall at Cheswick, Allegheny Co., Pa.

Although Christensen's "Index Filicum" and other authorities list *Botrychium dissectum* Spreng. as a separate species, it is rather difficult for an amateur to understand why it should be so regarded. Seen by itself on the mounted sheet there is no doubt a very marked difference between the typical *dissectum* and the typical *obliquum;* but when one finds, as any one who cares to look for it may find, the typical forms of *obliquum* and *dissectum* with a complete set of intermediate forms and all growing within a few feet of each other, then the differences do not seem so striking. I have never seen *dissectum* growing except in company with *obliquum* and always with the intermediate forms. If *dissectum* is a valid species, what are the intermediate forms?

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POLYPODIUM VULGARE IN MAINE

HENRY W. MERRILL

Maine with its 3,000 miles of rock-bound coast, its many mountains and almost numberless hills, the outcropping ledges that show their granite heads so unexpectedly above its many plains, is an ideal home for the hardy little polypody, that carpets the top of most of the ledges, or hangs gracefully over their brinks, or nestles beneath some evergreen tree, whose branches spread out their protecting arms, and whose fallen needles clothe the ground with a soft mantle, which in time decays and furnishes the rich soil needful for the development of plant life.

A writer in speaking of *Polypodium vulgare* (L.) states that it is not ordinarily a variable fern and that only a few forms have been named.

In a British work, "Choice Ferns," there are thirty-five named forms. Although the old world may be favored with more forms than the new world,—or it may be that our brother botanist across the water is more given to form names than we are,—the number of forms that have been brought to light in this country within the past few years goes far to prove that we have many of them at home and by careful search we may hope to bring many more out from their ledgy homes.

It was but a few years ago that *P. vulgare* v. *auritum* (H. W. Jewell) and *P. vulgare* v. *cambricum* (Miss E. S. Shaw) were the only two forms known in Maine. The former was found at Farmington and the latter was reported from Mount Desert Island.

Some two years ago the writer was fortunate in finding *auritum*, soon to be followed by the discovery of *hastatum.* These finds were not confined to a single station, but were scattered over an extent of many miles, which seems to be proof conclusive that these forms are to be expected at any station where the type is found. It was, indeed, a red-letter day when the writer found two fronds of what was afterwards determined as *Polypodium vulgare* v. *ovatum* (Moore). The long stipe and rather short blade, the graceful curve of the frond, the long tapering pinnæ, with their sinuate margins, with the background furnished by the mellow sunshine of a September day, formed a picture that will hang for many years on memory's wall.

Among the forms are found *elongata* (H. W. Jewell), *multifidum* (Moore), *ramosum* (Moore), *sinuatum*, with all of the pinnæ sinuate.

A station was found last fall (1909), under the low-spreading limbs of a hemlock, where the sun could only now and then shoot narrow rays of light for a form or freak, that was as "beautifully crisped and ruffled" as the *Polystichum acrostichoides crispum*, and it was with a sigh of regret that the few fronds gathered were placed in the press, for well we knew that the graceful ruffles would be ruined. This form was not confined to a few fronds, but there were hundreds of them, and no frond of the type was found with them.

Perhaps the most interesting find of any form of the species in this state was made last August by Mrs. A. E. Scoullar, at Standish. This proved to be *bifido-cristatum*. Druery describes it as follows: "Long, narrow, robust, crested; its short leaflets are fanned out at the tips into rounded crests, and the frond tip, repeatedly divided, forms a large, flat tassel."

Still another form has been found that, unlike *auritum*, which has ears on the lower side of the pinnæ, has ears on the upper edge of the pinnæ only. Mr. W. N. Clute says that this form is new and the finder is hunting for a name, but so far he has been unsuccessful.

Any one who is a fern enthusiast can spend many pleasant hours with the polypods and will undoubtedly be rewarded by finding of one or more forms, not mentioning the many freaks that will be constantly appearing before him.

HIRAM, MAINE.

FERN LEAVES, FERNS AND FERN ALLIES

R. C. BENEDICT

The topic would scarcely seem to be one in need of much discussion, but as morphologists and palæobotanists have lately added a good deal to our knowledge of the subject, completely changing some of the old conceptions, a brief resumé will not be out of place.

There has been a large amount written about ferns in the last few years, particularly about their anatomy and evolution,—and consequently about their relationships to other groups of plants, such as the lycopods, equisetes, cycads, flowering plants, etc. Taking pteridophytes as a whole, the number of printed pages devoted to this collection of plants in the last five years is in the thousands,—and this estimate does not include taxonomic literature. Among those who have contributed largely on this topic are Professor Bower of the University of Glasgow, Professor Jeffreys of Harvard, Professor Scott of Cambridge, and Professor Campbell of Leland Stanford.

These and a large number of others have expressed no doubt as to the distinction between leaf and stem in our modern ferns. A fern leaf is a lateral appendage of a fern stem, and has three main characteristics: (1)

It is rolled in a coil in the bud phase; (2) as it unrolls the apex continues to grow; this power of more or less indefinite growth is possessed most remarkably by Lygodium and the Gleicheniaceæ. Campbell refers to leaves of Lygodium which reach a length of one hundred feet, and in the Gleicheniaceæ the leaf apex may continue to unroll for several seasons; (3) fern leaves bear sporangia on the back.

Ferns then are pteridophytes with leaves of the type just described.

Fern allies should be, as the word "allies" implies, related to ferns. Relationship, as ordinarily determined in such cases, depends on (*a*) similarity of structure, and (*b*) actual relationship as shown by study of fossils.

According to structure, lycopods and equisetes, often called "fern allies," are not related to ferns at all. It is necessary only to point to the difference between their leaves and the leaves of ferns, and to the fact that their sporangia are borne either on the upper surface of the leaves, or on the stem itself. The internal anatomy is also different.

Neither according to the geological evidence, do ferns, lycopods, and equisetes show any inter-relationship. In the earliest horizons in which fossils of vascular plants are found these three groups occur, and differ in the same respects as today. This earliest period is estimated to be as much as sixty million years old.

However, a certain group of plants, alive at that time but extinct now, is of especial interest in determining what are fern allies. These were plants with leaves very much like fern leaves, so much so that until recently most of them were believed to be ferns. It has been found, however, that these plants bore seeds on some of the leaves. On other leaves they bore spores, contained in *spore cases* and *fruit-dots*, but these spores were the *pollen grains*.

Because of the many striking resemblances to ferns, it is believed that these "seed ferns," or pteridosperms, as they are called, were directly descended from plants ancestral also to the true ferns. The cycads or "fern palms" of our modern tropics, commonly included in the group *Gymnospermæ*, are generally recognized as descendants of the pteridosperms. This opens up a new line of fern allies, nearer at least than *Equisetum* and *Lycopodium*.

But a still greater line of "allies" will have to be recognized if recent researches of G. R. Wieland on Mexican cycads are confirmed. He has found among certain Mesozoic cycads a type of floral structure so much like certain modern angiospermous types that he has concluded that our common flowering plants must be descended from the cycad-fern line.

No one, however, is likely to include flowering plants under the title of fern allies. This name may be properly applied to three modern groups of plants, viz., the *Ophioglossales*, the *Salviniaceæ* and the *Marsiliaceæ*, the last two groups being often grouped together as the *Hydropterides*, or water ferns, but now believed to be related to separate lines of ferns.

The *Ophioglossales* have given rise to a large amount of discussion as to the exact nature of the fertile spike or panicle: Campbell at one time believed it to be primitive, and suggested that it might show a relationship with the liverwort *Anthoceros*. He has since withdrawn from that position. Bower believes these plants to be related to the *Equisetum* line, in which case they would not be fern allies, of course.

Probably, however, the most generally accepted view regards them as allied to ferns, and a recent paper by Chrysler (Bot. Gaz., **48**: 1909), in which evidence is given to prove that the fertile part represents fused pinnæ, furnishes strong support for this opinion. There is certainly no justification for comparing the leaves of these plants to the stems, leaves, and flowers of a peony.

It will be seen, then, that a magazine devoted to ferns, lycopods, and equisetes, can hardly be said to be devoted to one group of plants, and this distinction will have to be reserved for the four or five fungus periodicals, and the French bryophyte journal, the *Revue Bryologique*.

COLUMBIA UNIVERSITY.

NOTES ON SOME FERNS FOUND DURING 1909

PHILIP DOWELL

While attending the botanical symposium, at Stamford, New York, during the first week of July, 1909, I was interested chiefly in noting and collecting some of the ferns of the region. Beside the more common ferns and some that are noted further on, I may here mention the following as found in the region: *Phegopteris Dryopteris* (L.) Fée, *P. Phegopteris* (L.) Und., *Filix fragilis* (L). Und., *Matteuccia Struthiopteris* (L.) Todaro, *Dryopteris cristata* x *marginalis* Dav. About midway up Mt. Utsayantha there were a few plants of *Athyrium angustifolium* (Michx.) Milde growing in an open wet place. I did not see this fern elsewhere in the region about Stamford. Near the summit of the mountain there were *Dryopteris Goldiana* (Hook.) Gray, *D. dilatata* (Hoffm.) Gray, and *D. intermedia* (Muhl.) Gray. The two latter grew side by side, and I made a hurried but unsuccessful search for intermediates between them. On the wooded slopes of this mountain and of Bald Hill there were numerous little plants of *Botrychium lanceolatum* (Gmel.) Ångstr. and *B. neglectum* Wood. These two grew side by side and showed no striking difference in habit and general appearance.

The Clinton fern was not found except in two of the swamps visited, while the crested fern was quite common, especially in the alder swamps. The Clinton fern evidently prefers woodland swamps with larger trees. In such a woodland, in which a small ravine spreads out into a little swamp, I found a few plants of the Clinton fern and also a few plants of the hybrid between this and *Dryopteris intermedia.*

To me the most interesting find in the region was perhaps, that of numerous plants or clumps of *D. cristata* x *spinulosa* (Milde) C. Chr. This was found in several swamps, and quite as abundant as Boott's fern, which was frequent, especially in the alder swamps. Some idea of its growth may be gained if I state that from one clump I removed over twenty fronds, but that no apparent difference in its size was afterwards noticeable.

This fern, *D. cristata* x *spinulosa,* was recorded in Bull. Torrey Club 35: 136. 1908, as having been found at Suffern, N.Y., and in two localities on Staten Island. In Fern Bull. 17 : 35. 1909, E. J. Winslow records it from Barton Landing, Vt., and from Lowman, N.Y. L. S. Hopkins has found a number of specimens of this hybrid in eastern Ohio. During 1909 I found new stations for it at West Nyack, N.Y., and at Metuchen, N.J. However, in the vicinity of New York City it is rare compared to Boott's fern.[1] The latter I have found in nearly all swamps I have visited in which *D. cristata* (L.) Gray and *D. intermedia* were both found. Often it occurs only sparingly, but in some places quite abundantly. Even in places where *D. spinulosa* (Müll.) O. Ktze. is more abundant than *D. intermedia,* it has been found more frequently than *D. cristata* x *spinulosa.* It seems that in this vicinity *D. intermedia* hybridizes more freely than *D. spinulosa,* while farther north the latter hybridizes more freely than here. This is borne out also by the fact that there is a similar proportion of hybrids between these two and the Clinton fern, *D. Clintoniana* x *spinulosa* Benedict being less abundant here than farther north or than the corresponding hybrid with *D. intermedia.*

---

[1] **Cf. Observations on the Occurrence of Boott's Fern. Torreya 6: 205. 1906. New Ferns Described as Hybrids in the Genus Dryopteris. Bull. Torrey Club 35: 136. 1908.**

A new station for *Dryopteris Goldiana* x *marginalis* Dowell was found at Waterloo, N.J., on August 9. Both the putative parents were found abundant along a mountain rill, and after a diligent search I secured a fine plant of the hybrid, bearing four fronds. This plant is now growing nicely in my garden, in a much drier situation than its original home.

Mr. R. C. Benedict sent me a plant of this hybrid from Jamesville, N.Y.,[1] during the first week in July of the year. This also is alive in my garden, side by side with plants from Newton, N.J., the first locality for this hybrid.[2]

In the swamps at Lodi and West Englewood, N.J., there grow side by side the Clinton, the crested and the Goldie ferns, and with them numerous puzzling intermediates. The cross between the Clinton and the Goldie may be reported with confidence, but the others are somewhat doubtful. A few of these puzzling plants have been transplanted at home for further study.

PORT RICHMOND, N.Y.

---

[1] Torreya 8: 284. 1908.

[2] Bull. Torrey Club 35: 139. 1908.

LYCOPODIUM INUNDATUM IN THE WHITE MOUNTAINS

M. A. MARSHALL

In late August, 1907, a few days were spent at Breezy Point, Warren, N.H., and there, as elsewhere, the flora claimed much attention. No unfamiliar ferns were found, but one day, in walking up the rough mountain road leading from Merrill's Mountain Home to the Summit House on Mt. Moosilauke, a small *Lycopodium* was seen that has been pronounced typical *L. inundatum.* This road is built on the steep mountain side, in many places cut in on the upper side and built up on the lower, with a depression at the bottom of the cut to carry off water. In two hollows of this roadside gutter the little lycopodiums were found,—small weak plants, none over five inches long, clinging closely to the soil, some creeping up the rain-washed bank, most bearing each a sporophyte from an inch to an inch and a half in height. The plants were entirely separate, not more than two dozen in all. The neighborhood produced abundantly black spruce and balsam, *Spirea tomentosa, Pteris aquilina, Anaphalis margaritacea* and a dry-ground *Solidago.* A few rods away, lower down the mountain, was a carpet of *Lycopodium annotinum, L. obscurum,* and *L. clavatum* in intimate mixture, but, so far as observed, nothing justified the presence of an *inundatum* plant in that locality. It will be interesting to make further search for the plant in that neighborhood.

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H. E. RANSIER.

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CONTENTS

Page
FERN COLLECTING IN SOUTHERN CALIFORNIA . 17
POLYPODIUM VULGARE IN GREAT BRITAIN . . 19
A NEW HYBRID FERN 22
DRYOPTERIS FILIX-MAS X MARGINALIS PRODUCED IN CULTIVATION 24
POLYPODIUM VULGARE L. VAR. AURITUM WILLD. 25

ITEMS FOR MEMBERS:

HERBARIUM EXCHANGE LIST 28
COST OF FIRST NUMBER 31
NOTES 32

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American Fern Journal

Vol. 1 JANUARY 1911 No. 3

On the genus Dryopteris

CARL CHRISTENSEN

The genus *Dryopteris* includes, as delimited in my Index Filicum, nearly one thousand species. Like most other genera of ferns, it has reached its greatest degree of development in the tropics; northward it extends to Greenland and Alaska, southward to New Zealand, and it is represented in almost all regions inhabited by ferns, the southernmost part of South America being a marked exception. It is scarcely to be expected that this vast number of species were all derived from the same ancestors, and I have thought it possible, by a detailed examination of a large number of species, to find out whether the species really are all congeneric or not. I believe I have succeeded in solving this question.

While older authors considered a single character, as, for instance, the shape of the sori, indusium, venation, as sufficient for distinguishing genera, we are nowadays inclined to see the best generic characters in the general habit and growth of the species, and it must be granted that by considering these characters the prime ones, we have reached a much more natural arrangement of the ferns than before. The systematic arrangement of Diels, in Engler and Prantl, Natürliche Pflanzenfamilien, followed in my Index Filicum, highly surpasses the sys-

[No. 2 of the JOURNAL (1: 17–32) was issued 30 D 1910.]

tem of the Synopsis Filicum of Hooker, but it is by no means equally natural in all points. Diels united into a single genus, *Nephrodium* (now *Dryopteris*), all the species previously referred to *Lastrea, Nephrodium, Phegopteris, Goniopteris, Leptogramma,* and *Meniscium.* It is difficult to give a diagnosis of a genus including such different forms; but characters common to all species are the inarticulated stipes, the round or somewhat oblong dorsal sori, which are often covered by reniform indusia, and the never complicated venation. It is true that there is a great uniformity as to these characters, and species showing them must naturally belong together, but the question now arises, whether all these species belong to a single genus or to several natural genera, which together form a tribe, the Dryopterideæ. Many attempts have been made to segregate groups of species as genera; about thirty genera have been described by different authors, but only some few of them have been at any time generally accepted, e. g., *Lastrea, Nephrodium,* and *Phegopteris. Phegopteris* is even now considered a distinct genus by North American pteridologists. All these genera were founded on single characters, viz., whether indusiate or not, with the veins free or anastomosing, the sori round or oblong; but it must soon become obvious to each student of these ferns that none of the characters mentioned indicates a real affinity between the species placed under the same genus. Considering the species of temperate regions only, *Dryopteris* and *Phegopteris* appear very different, and it has seemed very natural to place our species under two genera. It must, however, be remembered that our species are poor representatives of a group of plants that reaches its highest development within the tropics. It is quite unnatural to found genera on such outlying species alone, in which differential characters have become stable ones, while in the tropical forms these same characters are highly variable. By examining a series of tropical Dryopterids, we soon find that such a character as the presence or absence of indusia is of no generic value, and even difficult to use as a specific character. A very large number of species, which have been referred to *Phegopteris*, are really indusiate, but the indusia are to be seen only in the very young sori. Moreover, we find very often that two forms, which can scarcely be distinguished by any other character, differ from each other only by the one being indusiate, the other exindusiate, but that, notwithstanding this difference, the two forms are closely related and must be referred to the same genus or even species. Quite the same can be said on the shape of the sori and on the venation, if goniopteroid (i. e., forming a few areolæ) or not. Genera founded on such characters (such as *Phegopteris*, etc.) are, therefore, not groups of related species, as natural genera should be, but may include a number of species that are often of a very remote affinity, e. g., *D. tetragona* and *D. phegopteris*, both sometimes referred to *Phegopteris;* on the other hand, species referred partly to one, partly to another genus, are intimately related, e. g., *D. patens*, often referred to *Lastrea*, and *D. mollis* (*D. parasitica*), which is a *Nephrodium.*

For these reasons I referred in my Index all these different species to a single genus, *Dryopteris*, although I was convinced that the genus ought to be divided into several genera. I could not accept the old genera, but I did not then know how I should divide *Dryopteris* in a natural manner. Since then I have examined thousands of specimens of American Dryopterids, belonging to about three hundred species, and I will try in a monograph, soon to be published, to arrange the species in quite a new manner. I do not intend now to create new genera, but I will divide the genus into provisional subgenera, several of which no doubt are good genera, but *vestigia terrent*. These groups are not based on a single character, but the species belonging to the same subgenus agree in several respects. The characters used are often apparently very minute and have previously been seldom considered as of any value, but they are, nevertheless, very constant. The best and most constant character is the pubescence, i. e., the type of hairs and scales. I have never found that a species varies as to the kind of pubescence; further, species that agree in other characters correspond exactly in pubescence, not in the more or less dense covering by hairs and scales but in the shape of the hairs and scales. For example, all species belonging to the subgenus *Ctenitis* have always only short, multicellular, articulated hairs and very characteristic toothed scales; those belonging to *Goniopteris* have always stellate or forked hairs, etc.

Sorting the North American species of *Dryopteris* according to my new classification, we have the following subgenera represented north of Mexico:

1. EUDRYOPTERIS (*Dryopteris* proper). Here belong the following species: *D. filix-mas, Goldiana, Clintoniana, cristata, marginalis, floridana, arguta, fragrans* (incl. *D. aquilonaris* Maxon), *spinulosa*, and *patula* (*mexicana*).
2. GROUP OF D. OPPOSITA: *D. opposita, oregana* (*nevadensis*), *oreopteris, noveboracensis, simulata*, and *thelypteris*.
3. GROUP OF D. PATENS: *D. patens* (=*D. stipularis* Maxon), *normalis* (=*D. patens* Auctt.), *mollis* (=*D. parasitica*), (Louisiana, Alabama, *Harper no. 130*), and *D. gongylodes* (*unita*).
4. PHEGOPTERIS: *D. phegopteris, hexagonoptera, Linnæana* (*dryopteris*), and *Robertiana*. (*Phegopteris alpestris* is an *Athyrium*.)
5. CTENITIS: *D. ampla*.
6. GONIOPTERIS: *D. reptans, tetragona*.
7. MENISCIUM: *D. reticulata*.

At least two other subgenera, *Glaphyropteris* (*D. decussata* and some few other species) and *Steiropteris* (*D. deltoidea* and five or six others) are represented in tropical America and the recently by me proposed new genus *Stigmatopteris* belongs to the Dryopterideæ. The Old World's species belong partly to the same subgenera, partly to others not represented in America. *Stigmatopteris*, *Goniopteris*, and *Glaphyropteris* are exclusively American.

COPENHAGEN, NOVEMBER, 1910.

Notes on Southern California ferns

C. C. KINGMAN

During the past year, which I have spent in Southern California, I have had opportunities for collecting and studying the western ferns in their native haunts, and I have enjoyed tramping over the mountains and exploring the canyons in search of these interesting plants.

At Pasadena, where I have spent most of my time, the foothills rise directly back of the city, and back of these hills lie the San Gabriel Mountains, a bold range of mountains having an elevation of five thousand feet, with several peaks, such as Mt. Lowe and Mt. Wilson, rising a thousand feet higher. These mountain sides are very steep and are difficult to climb, except by following the trails. On every side the mountains are furrowed by deep canyons, through each of which flows a small mountain stream that descends the canyon in a series of pretty waterfalls and cascades. These canyons are beautiful spots and are a paradise for the botanist, especially in the winter, when everything is fresh and green.

The cool, shady sides of the canyons are the favorite haunts of some of our finest ferns. Here among the damp mosses will be found the California polypody, *Polypodium californicum* Kaulf., which forms a thick green carpet covering large areas. I have found large fronds of this species that measured nearly eighteen inches long.

Polypodium Scouleri H. & G. is occasionally found here, but it is not common in this part of the state. It closely resembles small forms of *P. californicum,* but differs from that species in its blunter pinnæ, its larger and more numerous sori, and in its more leathery texture.

The golden-back fern, *Gymnogramma triangularis* Kaulf., is everywhere abundant. It is the fern that tourists press and mail in their letters as souvenirs. It flourishes in both sunny and shady places. The back of the frond is covered with a yellow, mealy substance that gives it its golden color. I have collected this fern in all parts of Southern California and last July I found the shriveled fronds of this plant abundant on Catalina Island.

Scarcely less abundant are the Pellæas, or cliff brakes. These ferns grow in a rather dry situation and seem to flourish best on rocky hillsides. *Pellœa andromedifolia* (Kaulf.) Fée is a medium-sized fern with rounded segments. It is very common and may be collected along the sides of the mountain trails and in all the canyons. The bird's-foot cliff brake, *Pellœa ornithopus* Hooker, is less common and grows in clefts of the rocks. Its ultimate segments are oblong and are grouped in threes, which give it the name.

The lace fern, *Cheilanthes californica* (Nutt.) Mett., is the most beautiful of all the smaller ferns. The fronds, which are one to four inches long, are delicately cut into many fine segments. This, too, is a rock-loving species and is frequently found along the trails at an elevation of two thousand feet or more.

Pteris aquilina L. is occasionally found, although it is not as common here as in the eastern states. It often reaches a large size, and sometimes the variety *lanuginosa* is found, with the fronds woolly or tomentose.

The maidenhair ferns are found in damp, shady places, often in springy ground. There are several species, the commonest being *Adiantum emarginatum* Hook., with broad fronds and rounded pinnules. This species matures quite early in the spring and then turns brown. I have collected it at Pasadena and Santa Barbara, and also on Catalina Island, where it is abundant on the hills overlooking the ocean.

I have not found *Adiantum capillus-veneris* (Kaulf.) Fée common at Pasadena, but I have collected fine specimens of it near Santa Barbara. In the Ojai Valley, in Ventura County, I once found a large patch of this fern so thick that I was obliged to tread on hundreds of the plants in order to walk up the canyon. This species differs from *A. emarginatum* in its longer lanceolate fronds and in the more wedgeshaped pinnules, which are more lobed on the upper margin; and it matures later, so that fresh fronds may be gathered late in the summer.

Among the larger ferns is *Aspidium argutum* Kaulf. This is an evergreen fern, resembling *A. marginale* of the eastern states both in form and texture. It is quite common on the shady sides of canyons.

Polystichum munitum (Kaulf.) Und. is one of the finest of our western ferns, and is found in the upper canyons. It resembles the Christmas fern but is much larger in every way, the fronds being two or three feet long and often over six inches in width. I have collected it on the Mt. Wilson trail at an elevation of 4,000 feet. Here, too, I have found *Woodwardia radicans* (L.) Sm., one of the largest of our North American ferns. The magnificent fronds are often nearly as tall as a man and the separate pinnæ are larger than the entire fronds of most of our ferns. As this fern takes kindly to cultivation it has been dug up and carried away, so that one must go out of the beaten path to find it in quantity. It is still quite common in the canyons near Santa Barbara.

In the winter the mountain sides are everywhere covered with *Selaginella rupestris* (L.) Spring. It is more upright and treelike than the eastern form. During a dry spell it appears to die away, but after a shower it immediately revives and becomes green again.

There are several species of *Equisetum,* the commonest being *Equisetum telmateia* Ehrh. The sterile plants resemble *E. arvense* but are twice as large. They may be found all summer near streams.

PASADENA, CAL.

A new Cuban fern

R. C. BENEDICT

(PLATE 2)

The discovery of the North or South Pole has never been of very great interest from the standpoint of botanical science, because there has been no prospect that such exploration would add any knowledge of botanical value. Geographically speaking, the botanically unexplored regions are practically all tropical, and such regions are still rather numerous. They occur principally in connection with high mountain ranges and on large islands. Some of these islands, like Java and Jamaica, are fairly well explored. Java is credited with about 600 species of ferns, and Jamaica has nearly as many, a large number of which are known only from this island.

But there are still several West Indian islands with high mountain ranges as yet only partly known, particularly Hayti, Porto Rico, and Cuba. In Cuba, for example, the highest range on the island, the Sierra Maestra, along the southern coast, has hardly been touched and probably contains a large number of ferns and other plants as yet undescribed.

Another hitherto unvisited Cuban range, the Sierra Nipe, located on the east side of the island, has recently been partially explored by Dr. J. A. Shafer, collecting for the New York Botanical Garden. From preliminary study, it appears that the collections contain a large number of undescribed flowering plants. The ferns have not been studied comprehensively, but in looking over the material of the genera included in the first part of Vol. 16 of the North American Flora, the writer found six species of *Anemia*, one of which is quite distinct from any species described in Mr. W. R. Maxon's monograph of the North American species.

It may be described as follows:

Anemia nipeënsis sp. nov.

Rootstock creeping, dorsiventral, rather slender, less than 2 mm. thick, branching, covered with very slender hairlike brown scales. Leaves in two rows, dimorphic, the sporophyl very attenuate, about 35 cm. long, 3-pinnate, with 3 or 4 pairs of scant involute pinnæ borne above the sterile leaves, the sterile leaves 20-30 cm. long, the petiole up to 20 cm. long, slender, blackish-brown below, paler above, sparsely scaly, the lamina deltoid, acute, 5-8 cm. long, 2.5-5 cm. broad, once pinnate-pinnatifid or even 2-pinnate on the basal pair of pinnæ, the pinnæ oblong to deltoid, rather bluntly acute, the margins somewhat revolute, slightly serrulate, the texture coriaceous and rigid.

Type collected on the Sierra Nipe, along trail Piedra Gorda to Woodfred, Oriente; on serpentine formation, 400-500 meters altitude; *J. A. Shafer, No. 3111,* 8 Dec. 1909. Type deposited in Underwood Fern Herbarium, New York Botanical Garden.

Anemia nipeënsis resembles *A. coriacea* Grisebach in the outline and texture of the sterile portion, but differs from this species in having wholly dimorphic leaves, instead of merely dimorphic pinnæ, as in that species. According to Mr. Maxon's key, it is closest to *A. aurita*

Sw. and *A. portoricensis* Maxon, but it differs strongly from these in the outline and texture of the divisions of the sterile lamina.

The genus *Anemia* is represented in the United States by two species, both of which extend north from tropical America. *A. adiantifolia* (L.) Sw., perhaps the commonest species of the genus, is found throughout the West Indies and in southern Florida. With its highly modified, erect basal pinnæ, it looks at first sight very much like a *Botrychium*. It is much more divided than *A. nipeënsis*. *A. mexicana* Klotsch, which ranges north from Mexico into Texas, is like *A. adiantifolia*, in having the basal pinnæ fertile, but the sterile portion is rather thin and herbaceous, once pinnate, and thus different from either of the other species above described.

The Cuban flora promises to be as rich in fern species as Jamaica, if the number of Anemias native there may be taken as an indication. Mr. Maxon credits twenty-six species of this genus to North America and records nine of these as found in Cuba. Recent collections of the New York Botanical Garden have included seven of these, and have added besides *A. nipeënsis*, *A. aurita* Sw. (either this or undescribed) and another which appears also to be undescribed. Dr. Shafer obtained in Oriente several numbers of the rare *A. coriacea* Griseb., and Mrs. N. L. Britton collected in Pinar del Rio what appears to be *A. speciosa* Presl, although her plant is bipinnate below, and in this respect not in agreement with Mr. Maxon's description of this species.

Thus, accepting twenty-eight as the number of North American species of *Anemia*, twelve of these are now known to occur in Cuba.

COLUMBIA UNIVERSITY.

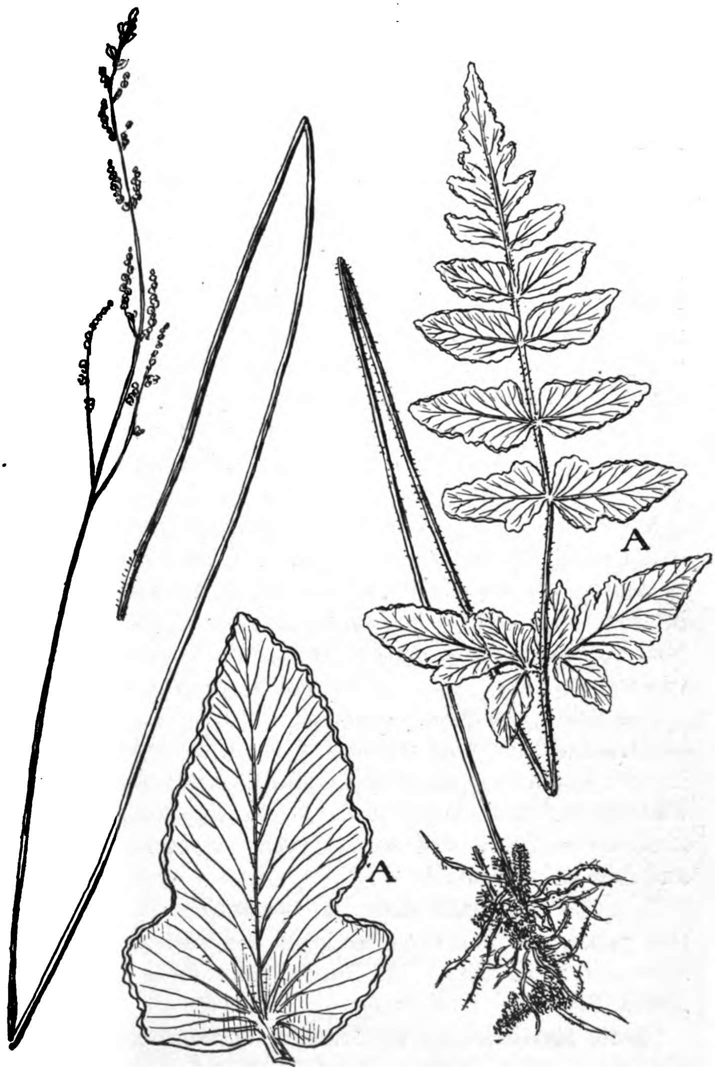

Plate 2

Anemia nipeënsis Benedict

(*Slightly reduced. One pinna, A, x 3.*)

Ferns of the Transvaal

R. C. BENEDICT

There appeared in the October number of the South African Journal of Science a paper entitled "The families, genera, and species of *Pteridophyta* of the Transvaal," by Joseph Burtt-Davy and Vicary Gibbs Crawley, both in government service there. The senior author, Mr. Burtt-Davy, is a professional botanist who went to South Africa to take the position of government botanist. At the time of his appointment to that position, he held a position in the United States Department of Agriculture. He was originally from England but came to America as a young man, and before he returned to British soil had become an American citizen and had taken an American wife.

Mr. Crawley was an employee of the Transvaal Audit and Exchequer Department, and thus not a professional botanist, but Mr. Burtt-Davy pays high tribute to his interest and ability in botanical study. He died on board steamer in September, 1909, while bound for home to be married.

The article occupies twenty-eight pages, and includes one hundred and nine species, of which twenty-eight are ferns, i. e., plants of the orders Ophioglossales, Marattiales, Filicales and Marsileales; there is one *Equisetum*, *E. ramosissimum* Desf., and ten lycopods, six in *Lycopodium* and four in *Selaginella*.

To quote from the text: "In preparing the keys for this paper, use has been made of the descriptions and illustrations in Mr. T. R. Sim's 'The ferns of South Africa.'"

"I am also indebted to Mr. Sim for the identification of my collection of *Pteridophyta*, which he worked out when preparing his paper 'Recent information concerning South African ferns and their distribution,' published in the Transactions of the South African Philosophical Society **16**: 267-300. 1906."

The Transvaal is an inland province on the east side of South Africa, about two hundred miles in extent each way. At the north it overlaps the Tropic of Capricorn upwards of fifty miles, so that a tropical or semitropical climate would be expected, and for the most part the names of the ferns are in accord with this assumption.

It is not, therefore, very surprising to meet the names of species known to occur almost everywhere in the tropics. Such are *Ophioglossum reticulatum* L., *Aspidium molle* Desv. [Sw.], *Adiantum caudatum* L., *A. capillus-veneris* L., *Pteris longifolia* L., *P. cretica* L., and *Osmunda regalis* L.

But when we find that the list includes species otherwise north temperate, or strictly American, the explanation of so anomalous a distribution appears impossible. In this class are *Ophioglossum vulgatum* L., *Nephrodium thelypteris* Desv. [Strempel], *N. filix-mas* Rich., *Asplenium adiantum-nigrum* L., *Polypodium vulgare* L., *P. incanum* Sw. [=*P. polypodioides* (L.) Hitch.], *Lycopodium clavatum* L., *L. carolinianum* L., and *Selaginella rupestris* Spring.

It may be possible to explain the riddle as partly due to incorrect identification, but not for all. Concerning a few species, there is no question as to the identity.

COLUMBIA UNIVERSITY.

A fern collector in Florida

F. T. PEMBER

It was my pleasure to spend the time from February 15th to April 15th, 1910, in southern Florida. About half of this time I put in on the west coast, in the Manatee country, and the balance at Miami and Palm Beach, on the east side of the state. From the latter place I made trips into the Everglades and along the line of the Florida Keys

Commencing our search at Bradentown, on the Manatee River, we readily find *Dryopteris patens* (Sw.) Ktze., *D. unita* (L.) Ktze., *Woodwardia areolata* (L.) Moore, *Pteridium aquilinum caudatum* (L.) Kuhn, and *Acrostichum excelsum* Maxon. The last is a giant among ferns, growing mostly in salt or brackish marshes, and so has been called the salt marsh fern. I found stalks of last year's growth nine feet high, with stipes as thick as a man's finger, and single pinnæ a foot long, often thirty pairs of them on a single frond, and very much crowded, with the sporangia covering the entire back of the frond and sometimes on the front also

Woodwardia is abundant but does not fruit till later. *Pteridium aquilinum caudatum* abounds everywhere, and is so well marked that it would deserve specific rank did it not grade insensibly into the typical form farther north. I measured old stalks eight feet high, but in dry places it is mostly under two feet.

In the hammocks and growing on the trunks and large horizontal limbs of oaks, often covering them entirely, is the pretty *Polypodium polypodioides* (L.) Hitch. This flourishes in the rainy season and then dries and shrivels up, like the resurrection plant, and can remain in this condition indefinitely, but revives again with the first moisture. I brought some home that had been dried up for months, but they became bright green, erect and vigorous an hour after being placed in water.

Blechnum serrulatum L. C. Richard, a large, distinctly marked fern, with many long, entire and close-veined pinnæ, I found abundant in all moist places. The common sword fern, *Nephrolepis exaltata* (L.) Schott, so frequent in cultivation, I found here in only two places, but it is most abundant on the east coast. *Phlebodium aureum* (L.) R. Br., a peculiar-looking, large, broad, and coarsely divided fern, I found both on the ground and on the trunks of palms. I found also *Campyloneuron phyllitidis* (L.) Presl, often called hart's tongue, though very unlike the one found in central New York. It has erect, rigid, undivided leaves, from 2 to 3 feet high and 1 to 4 inches broad. From my experience, I judge it is rare.

The only ferns I saw in Florida that I find in eastern New York are the cinnamon, marsh, and royal ferns. The above complete my list from this locality, except for two or three that I have not identified from the young sterile fronds. A few others are there and could be found later in the season.

On the east coast, near Miami, I found all those mentioned except *Campyloneuron phyllitidis* (L.) Presl, and in abundance four new ones. One of these, *Pteris longifolia* L., has fronds narrower than those of the sword fern. Another *Pteris*, *P. cretica* L., is silvery in color, with extremely narrow, stiff, wiry pinnæ, but retains the shape and horizontal spread of *Pteridium aquilinum*. *Anemia adiantifolia* (L.) Sw., a most beautiful fern of small to medium size, grows on dry coral rock, and has the two lower pinnæ fruiting and lengthened above all the others. I found here *Vittaria lineata* (L.) Sm., the grass fern, the strangest and least fernlike-looking of all. The fronds are about ⅛ inch wide and from 15 to 36 inches long, as I know, though Underwood says 6 to 18 inches. I found them on trunks of the palmetto only, and sometimes 200 or 300 of the grasslike fronds in a clump. Had I not known of their existence, I would not have collected them for ferns.

Back of Miami, near the Alligator Farm, are acres of *Nephrolepis exaltata* (L.) Schott. The plants are mixed with *Blechnum serrulatum* L. C. Richard and *Pteris cretica* L., and all grow from the ground and none on the palms. At Palm Beach, where they are plentiful, none grow on the ground but all are high up on tall palmettos. In many places there are dozens of plants to a tree, a circle of them under the fronds of the palm.

The Florida Keys seem unsuited to fern life. I found nothing new and very few indeed of any kind of ferns.

Collecting in Florida has its unpleasant features. Many of its thickets and jungles are almost impenetrable, and it has five species of poisonous snakes which grow very large. On former trips for birds, mammals, and reptiles, I have met many of them.

The small black mosquitoes of the Everglade section bite without the warning song and inject five times the venom that the New Jersey mosquito does. Then there are ticks, chigres, and red bugs, all with a wild desire to get into your flesh.

The first is likely to locate in your back hair, and is half buried before you feel him. He is tougher than leather, and it needs a yoke of oxen to pull him out, and then his head and jaws are left in the flesh.

The red bugs are worst of all, and so small as to be scarcely visible to the naked eye. They do not exactly burrow but so poison and irritate the flesh that it swells up from both sides and covers them, and the man who never learned to scratch before, will acquire the knack at once. They get mostly on the ankles or below the knees, and after April 1st it is safer and wiser, after every trip through grass or bushes for specimens, to bathe in sal soda solution as strong as it can be made.

Such things annoy one at the time, but are a source of amusement afterwards, and we always feel the desire of making the journey again even if we have the same experience.

GRANVILLE, N. Y.

Fern notes from the South

E. L. LEE*

Dr. E. L. Lee, of Bridgeport, Ala., in writing to the secretary, has imparted information in regard to two of our most interesting ferns, that seems of sufficient importance to warrant its publication in the JOURNAL. With some slight alterations and omissions, the letters are given below:

Under date of November 21, 1910, Dr. Lee writes:

"Referring to your request and my promises of some months ago, I am sorry to say that I will fall short of my expectations and desires.

"In the spring we had the most destructive forest fire that has swept our mountains in years. The crowns of the ferns were so burnt that many of them were entirely destroyed. My knowledge of this is based upon a somewhat limited area where we spend a portion of the summer and where the ferns have been observed over a period covering several years.

"Another surprise to me was the complete disappearance of *Asplenium Bradleyi* Eat. and *A. pinnatifidum* Nutt. However, I do not believe the forest fires had anything to do with their disappearance. This particular colony was directly under our own home, where I had good opportunities to observe them.

"Last year we did not go to the mountains. This year we did, and found the entire colony of both *A. Bradleyi* and *A. pinnatifidum* had completely disappeared. The colony was not robbed, for no one here knew of them but myself. Dr. Charles Mohr, our former State Botanist, reports them small and insignificant. Are they degenerating and disappearing, or is this merely the tragedy of a community?

"We had hoped to visit other cliffs of the same range, but seventy-one years and rheumatism are sufficient to dampen somewhat the enthusiasm of even a fern student."

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* Sent by L. S. Hopkins for publication.

Writing further, under date of December 21, 1910, Dr. Lee continues:

"I will take up one by one your questions as to when the fires occurred, over what range of territory they extended, where the stations are from which the ferns disappeared, etc.:

"The fires occurred last March. This month was a record breaker in the South for light rainfall and for the bright, sunny days that prepared the mountains for such destructive fires.

"If you will take a good map of Tennessee and trace the Cumberland Mountains and Walden's Ridge (a parallel range) with the little valley of the Seguatchee between, you will have the field of our forest fire.

"A geological map will show this quicker, as the coal field represents the mountains. Page 116 of Safford and Killebrew's little Geology of Tennessee will show you the situation at a glance.

"Would say this field is about thirty-five miles wide and extends entirely across the state in a northeasterly direction, 125 to 150 miles long. We are just on the line between Tennessee and Alabama and 30 miles west of Chattanooga, the southern extremity of it.

"The stations for *A. Bradleyi* and *A. pinnatifidum* with which I am acquainted are near Bridgeport, on one of the spurs of the Cumberland. We have a little summer home there and the stations are near it.

"My period of observation has extended over ten years. The ferns seemingly grew out of the bare face of the cliffs and overhanging rocks from two or three to fifteen feet high.

"That particular locality is all I have examined, but was led to believe they follow the mountains for about 100 miles farther. Dr. Mohr reports them in the adjoining county, ending in Clay County. The query with me is, are they moving the line of their limit up a little? Dr. Mohr reports all of these plants as very small.

"The wood ferns suffered most from the fire. Where they grew in profusion some three or four years ago, there are now only a few scattered plants left, and they were not mature when we were in the mountains in August.

"The intensity of the fire is shown by the fact that where the timber had been cut away and two or three tops had fallen together, I found there mountain stones burned till they fell to pieces, and where a stump had burned out the rocks looked as though a house had burned down on them."

BRIDGEPORT, ALA.

A collecting trip in southern Florida*

JOHN DONNELL SMITH

The thirty-two years that have gone by since Austin and I made our moss-hunting trip to South Florida seems to have left me with a poor recollection of its incidents, whether scientific or personal.

At that time the geography of the region bordering the upper Caloosahatchie River was imperfectly understood, and its botany was, of course, even less known. In fact, it was then supposed that the river has its rise in Lake Okeechobee, and I expected to pass by boat into the big lake and there do most of our botanizing. It was not until the following year that it was discovered that a pine barren ridge separated Lake Flirt from Lake Okeechobee.

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*A letter received by Mrs. N. L. Britton, in reply to a request for information regarding a collecting trip made by Coe F. Austin and John Donnell Smith, in 1878.

For several years previously I had been in active correspondence with that eminent bryologist, Coe F. Austin, but had not known him personally. I had been a purveyor to him of much material of Musci and Hepaticæ, and was indebted to him for many critical determinations. At my invitation, he joined me at Cedar Keys, Florida, in March, 1878. In a good-sized sail boat of slight draft of water, and with a man to cook and help, we sailed down the gulf coast, chiefly keeping inside of the islands and reefs, and landing frequently to collect. In Charlotte Harbour, Pine Island was our headquarters, and its shell mounds presented an interesing and novel moss flora.

When the Caloosahatchie River became too narrow for sailing, we secured a whitehall sixteen-foot rowboat, and thus completed our ascent of some ninety miles up to Lake Flirt. At that season nearly the whole region was under water, and it was often difficult to find a dry spot for pitching our little tent. Much of the collecting was done while wading up to the knee or even higher. On one such wading trip we came across *Ophioglossum palmatum* L., and it was not until we had access to current literature that we learned we were not its first discoverers outside of the tropics. That very month Dr. A. W. Chapman was publishing in the Botanical Gazette its occurrence on the banks of the Caloosahatchie River. Here, too, in extensive mats on the surface of stagnant water, we met with *Wolfiella floridana* (Donn. Sm.) Thompson. The new or little known mosses were in the following years described by Austin in the Bulletin of the Torrey Botanical Club.

You are better qualified than I am to appreciate the importance of our collections during this expedition and the value of Austin's scientific work. But I can certify to his enthusiastic enjoyment of this his introduction to a semitropical world, and to my own unqualified enjoyment of his society.

BALTIMORE, MD., 31 DECEMBER, 1910.

On the study of ferns

PHILIP DOWELL

A few suggestions and occasional reflections on the study of ferns are here presented for the consideration of the reader in the hope that they may be of help to some and of interest to others.

The particular course of plant study to be pursued, like our calling in life, need not be hastily decided on. That will depend largely on circumstances and individual bent and capacity, and need not even be considered at the outset. Some of the most noted botanists have begun by simply going afield and enjoying nature. By constantly associating with plants they have become interested in them and more or less acquainted with them, and later they have become more deeply interested in some special line of plant study.

In order that the student may arrive at the safest conclusions and secure the best results in the study of ferns, he should be acquainted with the plant as it appears in its natural state. Field study should be pursued side by side with the other lines of fern study, whether we emphasize the taxonomic, morphologic, physiologic, pathologic, ecologic, economic, or other phase. When the student is acquainted with the plant as it grows in its natural surroundings, he can to more purpose study its behavior in the laboratory, or elsewhere outside of its natural state and under changed conditions. He can also with more certainty determine the natural relationship of the plant as compared with closely related plants.

One illustration suggests itself for consideration at this point. Numerous unsuccessful attempts were made recently to cross *Dryopteris noveboracensis* (L.) Gray with *D. thelypteris* (L.) Gray, and as a result doubt was cast on the existence of fern hybrids in nature.* These experiments go far toward showing how great is the difficulty attending the attempt to produce hybrids among ferns artificially or experimentally. On the other hand, the fact that Dr. Hoyt did not succeed in crossing two species from which hybrid plants have been actually produced experimentally, by Miss Margaret Slosson,† rather detracts from the value of his experiments as a basis for authoritative conclusions. A little more field study might have suggested the probable futility of trying to induce two species of ferns to cross under adverse conditions when they have not been found to do so in their more healthy natural state, without first succeeding in crossing species of which the hybrids have been found actually produced in nature, and even experimentally in the laboratory.

It is not safe to confine observations and conclusions to material preserved in jars, on microscope slides, nor elsewhere, nor to plants growing under abnormal conditions away from their natural surroundings, nor to any one single phase of the problem that presents itself; but the study of such material should be carried on side by side with the study of live material growing in its natural state, and the particular phase of the problem should be viewed parallel with other problems of plant study. The best place to study our native ferns is in their natural habitat, where they are found growing wild. When it is impracticable to study a plant in its natural habitat, the plant should be transplanted to a more accessible place, where it may be observed repeatedly. This place should have as nearly as possible the same conditions under which the plant grew in nature. It must not differ too much, for if the change in surroundings and conditions of growth is too great, the plant may not behave under the observer's care as it would while growing in its more natural state.

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* W. D. Hoyt. Physiological Aspects of Fertilization and Hybridization in Ferns. Bot. Gaz. **49**: 340. 17 May 1910.

† Bull. Torrey Club **29**: 487. 3 Au 1902.

Except in the case of many of the rock ferns, our native ferns in general usually thrive well when transplanted into proper soil in the garden, not too much exposed to the midday sun. Out of about one hundred and fifty fern plants, about forty five of them hybrids, thus transplanted into a small city lot from various places in the vicinity of New York, some of the evergreen wood ferns have grown thus for six seasons. None of the transplanted ferns have died of their own accord except the silvery spleenwort, the Clayton fern, *Lygodium*, and most of the rock ferns. Some of the common ferns spread from the rootstock so rapidly that it is difficult to get rid of them after they become established, such as the sensitive fern, the lady fern, and especially the New York fern and the hay-scented fern. The chief difficulty in transplanting has been to get sufficient shade to reproduce natural conditions. As a consequence some of the more exposed plants have shown a tendency to produce wider and more full leaves toward the end of summer than at the beginning, making the divisions of the leaves appear more crowded in the later than in the earlier leaves. In the case of some of the plants the tendency has been toward a more or less permanent change in this direction. Thus plants of *Dryopteris cristata* (L.) Gray transplanted from shade have become more like those growing naturally in the open. It may be added that *Dryopteris* plants have usually not developed a robust and vigorous growth before the third season after having been transplanted. This is probably due largely to injuries sustained in the transplanting rather than to the change in conditions.

Spores may be sown and the development and growth of the plant observed from the prothallium up, afield if practicable, otherwise under as natural conditions as possible elsewhere. In a small city lot the supply of plant food is rather small in proportion to the demand, and so it is difficult to raise young plants and preserve them from hungry vermin.

This field work, with the transplanting and raising of plants, is important in all lines of fern study, to the morphologist, physiologist, pathologist, and perhaps more especially to the horticulturist, ecologist, and systematic pteridologist. It is especially helpful in solving problems in connection with the range of variation and behavior of plants under various conditions, and problems of identity and relationship involving the determination whether a particular plant is a form, mutant, variety, species, or a hybrid. When a plant is found that cannot at once be definitely assigned to some known species, its place of growth should be carefully noted, so that the plant may be visited and its characters noted from time to time while it is still growing afield if that be practicable, otherwise the plant should be moved to a more easily accessible place. After having noted the characters of the plant at different times through a season or two, the observer can usually reach a fairly safe conclusion in regard to the identity and relationship of the plant.

For the purpose of becoming acquainted with the plant and for purposes of ready reference and permanent records, the collecting of herbarium specimens is a great help, provided care is taken to collect enough representative material and to dry it in such a way that it will preserve the natural character of the plant as nearly as possible.

Such a specimen, if accompanied by full data regarding its place of growth, when collected, etc., will serve to aid the student in recalling and fixing in mind many points of interest that might otherwise be readily forgotten. When a fern is transplanted a part of the plant may usually be made into a herbarium specimen and thus a permanent record preserved.

As for the name of the plant, that need not seriously worry the student, since the specimen may be designated by a number, at least to begin with, and the name can be supplied when wanted. The scientific names, which to the outsider and to the beginner at first seem so long and difficult, may become as easy and familiar as those of our friends. Besides, the main object is not to find the name of the plant, but to find out something about the plant itself, its conditions of growth, and its relationship to other plants. To name the plant is not systematic botany, as has been so often claimed by those who are afraid of these scientific names, and who consider it too troublesome to go afield or to bother with collecting herbarium specimens. But just why it would be more difficult to remember and refer to *Polypodium vulgare* than to *number one thousand three hundred and twenty-eight*, or to *Polypodium number seven hundred and fifty-seven*, perhaps some one can tell us who advocates the use of numbers instead of scientific names.

Let us not stand aloof and view the mountain at a distance, dreading the labor of the climb, but let us go on and up, enjoying the climb and the broader and more commanding view from the crest. We may study the plant with a view to finding out what we can about its structure, gross and microscopic, its development and growth, how it is nourished, what substances it uses for foods and what substances are harmful to it, what diseases or insect enemies it may be subjected to, how it may be transplanted and propagated to advantage, how it varies in size, color, habit, etc., according to changing conditions, how it is related to other plants and how it may be classified, etc. Or we may pursue any one of these lines more thoroughly than the others, and this to the best advantage when we do not neglect the living plant in its natural state.

Broadly speaking, each branch of botany, or each line of plant study, is as important, progressive, and productive of knowledge and intellectual development as any other; whether we study the plant from the economic standpoint, how it may minister to our wants or otherwise affect our welfare, and how we may modify its conditions of growth, improving the good and destroying the bad; or from the purely scientific point of view, study its structure, growth and behavior under various conditions, the development and functions of its organs and tissues, its relation to environment, and the relation of the plant in these respects to other plants and its position in the systematic classification of plants; or from the point of view of education and culture, aim to develop a more intelligent, broader and better view of life.

PORT RICHMOND, N. Y.

Notes on ferns attacked by a leaf roller

PHILIP DOWELL

The fern student has no doubt noticed occasional fronds rolled up and drawn together at the tip. On closer examination he has found that a fine web has been spun, holding the parts together, and that the ball or nest thus formed is the home of a small larva. The attacks of this larva were especially noticeable during the summer of 1908, and have not been so noticeable during the past two years.

On October 10, 1908, at a meeting of the Section of

Biology of the Staten Island Association of Arts and Sciences, the writer commented on the attacks of this larva, and recorded comments in the Proceedings of the Section of Biology as follows:*

"The ferns were more than usually attacked by a leaf-rolling insect, the larva of which had destroyed the tips of many of the fronds especially of the Christmas fern and various species of *Dryopteris*. The larva was determined by Dr. H. G. Dyar, of the U. S. National Museum, as a pyralid (*Pyrausta* sp.). This attack on the tips of the fern fronds has also been noticed by Mr. Harold W. Pretz, of Allentown, Pa., and commented on in a letter (Aug. 28 [1908]), in which he said: 'Our ferns near home are in poor condition from the attacks of some larva. *D. cristata* × *marginalis* has suffered very much.' It might be added here that the attacks of the larva were made chiefly during the early part of the season."

The same thing had been noticed by Mr. William R. Maxon and was recorded in the same proceedings† for the meeting of the Section of Biology on December 12, 1908, at which meeting he was present, and "mentioned the fact that he had noticed the fronds of *Dryopteris simulata* Dav. in Maryland attacked by an insect, which had spun a fine web and drawn the pinnæ of the tips together."

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*Proc. Staten Island Assoc. **2**: 170. 18 Au 1910.

†Loc. cit. **2**: 172. 18 Au 1910.

Ferns at home and visiting

KATE D. SPALDING

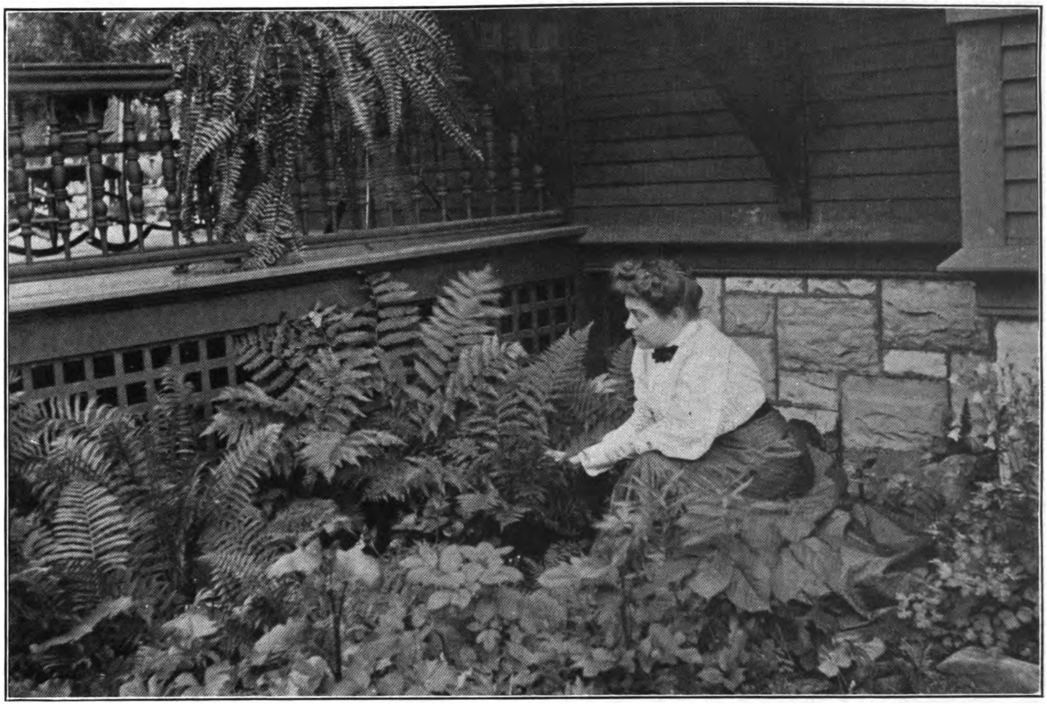
(PLATE 3)

In the course of a short walk one summer day, I found seven different kinds of ferns and picked a frond from each plant just for the love of them. A friend, seeing them, exclaimed, "They all look alike to me!" It hardly seems possible that a person having eyes should see so little of beauty around him.

There is no more fascinating study for the amateur botanist than ferns, especially if he lives in a locality where they are abundant. Everyone admires their graceful beauty. After having been familiar with their forms all of one's life, it is most interesting to learn to call these neighbors by their names. The widespread popularity of nature study has opened our eyes to many things hitherto unnoticed. If one has a hobby, that hobby is a source of pleasure wherever one goes, and keeps one young. Rue the day when you cease to be absorbingly interested in some specialty.

The first visit to the woods after one has begun to learn more about the growing things will be different from any other trip. I well remember such an occasion. It was on a late September afternoon when the summer's growth was finished. Overhead arched magnificent trees, while the rays of the setting sun cast a golden glow over all. Ferns on every side! Rocks and mounds entirely concealed by the walking fern and big bunches of the cinnamon, spinulose, and other large ferns, often named brakes by the uninitiated, while from the crevices of the rock formation at our feet peeped out rosettes of the dainty maidenhair spleenwort. That student is fortunate who has the woods of New York State or Vermont for his fern textbook.

But one need not depend on going to the often distant



A FERN CORNER.

woods in order to enjoy a sight of ferns. Ferns are ornamental in a suitable corner of the garden and will repay the labor expended upon them many times over in the pleasure they give. A fern cannot be transplanted to any place but will take kindly to civilization if it has plenty of shade, moisture, and good soil. First of all, it is necessary to prepare the bed carefully. Dig out the space required at least two feet and fill in with rich loam or preferably with leaf mold from near-by woods if possible, at least have a top dressing of soil from the woods.

A certain fernery was planted, quite successfully, with three divisions, a swamp, a plain, and a hillside in miniature. The swamp was contrived from a box sunk into the ground and partly filled with loam and moss. Here were planted such ferns as lived in wet places and the box was filled with water twice a day. Over the edge drooped the lovely royal fern (*Osmunda regalis*) and near by lived the sensitive fern (*Onoclea sensibilis*), while in the box were planted the marsh shield fern and the chain ferns.

By far the greater variety of ferns was found in the next division, which was arranged as much as possible like the natural woods, with rocks and logs and leaf mold. Sturdiest among them, and even crowding its neighbors, was the ostrich fern (*Matteuccia struthiopteris*) with its graceful vaselike formation. In the background towered taller ferns, the Goldie (*Dryopteris Goldiana*) and the Clinton (*Dryopteris Clintoniana*), both of which ferns had flourished for many years far from their native wood and had been retransplanted to this garden. The cinnamon fern (*Osmunda cinnamomea*) always did well, sending up more large woolly croziers each spring. The marginal (*Dryopteris marginalis*) and the spinulose (*Dryopteris spinulosa*) together with the Christmas fern (*Polystichum acrostichoides*) gave an evergreen touch to the bed. The narrow-leaved spleenwort (*Athyrium angustifolium*) and the interrupted fern (*Osmunda Claytoniana*) also flourished, but the delicate oak fern (*Phegopteris dryopteris*) did not take so kindly to transplanting. The crested fern (*Dryopteris cristata*) and the maidenhair (*Adiantum pedatum*) made good growth while the lady fern (*Athyrium filix-femina*) grew rank in sunshine or shade. These ferns with others formed a mass of luxuriant foliage from early spring until the frost came. During the winter a covering of leaves was laid over the bed and in spring only a part of the dressing was removed, thus giving the woods corner a more natural look, besides adding in time to the fertility of the soil. Altogether, considering the small space used and the little care required after the first labor, only a good watering each day, that corner gave the owner more enjoyment and satisfaction than any other part of the garden.

At the farther side of the fern bed was built a rockery where ferns requiring little soil could imagine themselves clinging to their native hillsides. These ferns showed more homesickness than the others, but still did survive. Of course the bulblet bladder fern (*Filix bulbifera*) grew everywhere and with its lacy fronds covered up the bare places, while its sister, the fragile bladder fern was the beauty of the early spring. The purple cliff brake (*Pellœa atropurpurea*) showed itself hardy under new conditions and the maidenhair spleenwort (*Asplenium trichomanes*) grew to quite a large size. The Woodsias did fairly well but the ebony spleenwort (*Asplenium platyneuron*) and the walking fern (*Camptosorus rhizophyllus*) grew very slowly.

The primary object of this particular fernery was not so much a beauty spot as a collection of as many varieties of ferns as possible in small space, but it could not help being a beauty spot just the same. If one does not live in a locality where many kinds of ferns are found, there are dealers who make a specialty of supplying them. If a fernery is chiefly to beautify the garden, a selection of larger ferns, such as grew in the middle section of this corner, would give more satisfaction than the small rock ferns.

Another attractive feature of this fern bed was the wild flowers. Many sprang up from seeds in the soil, while others were brought from the woods. It was a source of early spring pleasure, while the croziers of the ferns were slowly unfolding, to watch for new blossoms each day, Jack-in-the-pulpit, hepaticas, violets, coltsfoot, Solomon's seal and others in their season. Even cowslips and cardinal flowers were persuaded to blossom in the swamp box. A sprig of meadow rue, a goldenrod, and a Joe-pye-weed also found a footing in this goodly company. Each day some new and charming aspect presented itself to the watcher, and with no extra labor. All these friends ask is to be left alone under favorable conditions and they will fulfill their destiny to the best of their ability.

Henry Ward Beecher once said:

"Ferns and flowers are the only things God made and forgot to put a soul into them."

SYRACUSE, N. Y.

Notes and news

Mr. William R. Maxon, of the United States National Museum, leaves on a collecting trip to Panama at the end of January.

On the evening of January 12, 1911, Mr. Robert A. Ware gave a talk on New England ferns before the Boston members of the Appalachian Mountain Club. He discussed the structure and growth of the fern and showed specimens of all the species native to New England. Other members of the American Fern Society who were present are Messrs. F. G. Floyd, H. G. Rugg, and E. J. Winslow.

Recent elections of interest:

President of the American Association for the Advancement of Science, Dr. Charles E. Bessey, professor of botany and dean at the University of Nebraska.

President of the Botanical Society of America, Professor W. G. Farlow, of Harvard University.

President of the Torrey Botanical Club, Dr. Henry H. Rusby, professor of botany and dean at the New York College of Pharmacy.

Mrs. M. A. Noble, of Inverness, Fla., whose herbarium was destroyed by fire some time ago, has received many specimens from members of the American Fern Society, but still lacks a large number, particularly of western species. Those who can spare duplicates of such specimens will confer a highly appreciated favor by sending them to Mrs. Noble.

Mr. W. A. Poyser, Hammond, Ind., offers specimens of *Equisetum scirpoides* Michx. to members of the American Fern Society.

Mr. Willard N. Clute, of Joliet, Ill., for a number of years chairman of the Advisory Council of the American Fern Society, has resigned as a member of the Advisory Council, and the office of chairman devolves on Dr. C. E. Waters, of the Bureau of Standards, Washington, D. C.

Corrections and additions to the list of members:

10. Barbour, W. C., Succasunna, N. J.....................1910
129. Sanborn, Miss Sarah F., 54 Centre St., Concord, N. H....1910
130. Prince, Prof. S. Fred., 1207 W. Main St., Urbana, Ill.....1902
Steere, Mrs. Wm. W., 10 Holmfield Ave., Hyde Park, Mass.
Grout, Dr. A. J., New Dorp, N. Y.....................1911
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Published by the

AMERICAN FERN SOCIETY

◆

PHILIP DOWELL, Editor

RALPH CURTISS BENEDICT, Associate Editor

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CONTENTS

Notes of a naturalist afloat—I (Plate 5)
William Edwin Safford 121
Notes on the ferns of the Isle of Pines, West Indies
Otto E. Jennings 129
An interesting find .... Harold W. Pretz 137
Lycopodium flabelliforme .... E. J. Winslow 141
Edward Palmer .... William Edwin Safford 143
Grace A. Woolson .... Emily Hitchcock Terry 148
Notes and news 149
Index to volume 1 151

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VOLUME 2

PORT RICHMOND, N. Y.
1912

CONTENTS

No. 1, for January, issued 29 February 1912

Notes of a naturalist afloat—II (Plate 1) William Edwin Safford 1
The Colorado Desert for ferns .... F. T. Pember 12
Random notes on Bermuda ferns . Harold Goddard Rugg 16
A new name for a Hawaiian fern ...... William R. Maxon 19
A new fern from Panama .... William R. Maxon 21
A plea for fern protection .... Orra Parker Phelps 22
A new locality for Asplenium ebenoides Charles H. Bissell 24
Notes and news 25
Some literature on North American ferns, 1911 27

No. 2, for April, issued 11 May 1912

Notes of a naturalist afloat—III (Plates 2, 3) William Edwin Safford 33
Lycopodium selago from Ohio .... Lewis S. Hopkins 46
Observations on some Lycopodiums of Hartland, Vt. Nancy Darling 49
Carl Frederik Albert Christensen: some biographical notes .... R. C. Benedict 53
Letter to the members of the American Fern Society Robert A. Ware 58
Some hybrid ferns in Connecticut .... E. J. Winslow 63
Notes and news 64

No. 3, for July, issued 3 August 1912

Notes of a naturalist afloat—IV WILLIAM EDWIN SAFFORD 65

Vermont, the fern lover's paradise HAROLD GODDARD RUGG 83

Another station in central Vermont for Dryopteris filix-mas and for the new hybrid filix-mas × marginalis F. E. CORNE 93

Notes and news 96

No. 4, for October, issued 18 December 1912

Notes of a naturalist afloat—V . WILLIAM EDWIN SAFFORD 97

Roughing it to the Yosemite . . . . H. HARWOOD TRACY 107

Further notes on the fern flora of Ohio . LEWIS S. HOPKINS 115

Outings for Onondaga moonwort and slender cliffbrake H. E. RANSIER 119

Whittier's herbarium . . . . HAROLD GODDARD RUGG 121

A suggestion on the field study of ferns . PHILIP DOWELL 123

Notes and news 124

Index to volume 2 125

Vol. 2 JANUARY 1912 No. 1

American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

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PHILIP DOWELL, Editor

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CONTENTS

Notes of a naturalist afloat—II (Plate I) WILLIAM EDWIN SAFFORD 1
The Colorado Desert for ferns - - F. T. PEMBER 12
Random notes on Bermuda ferns HAROLD GODDARD RUGG 16
A new name for a Hawaiian fern - WILLIAM R. MAXON 19
A new fern from Panama - - WILLIAM R. MAXON 21
A plea for fern protection - - ORRA PARKER PHELPS 22
A new locality for Asplenium ebenoides CHARLES H. BISSELL 24
Notes and news 25
Some literature on North American ferns, 1911 27

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American Fern Journal

Vol. 2 JULY 1912 No 3

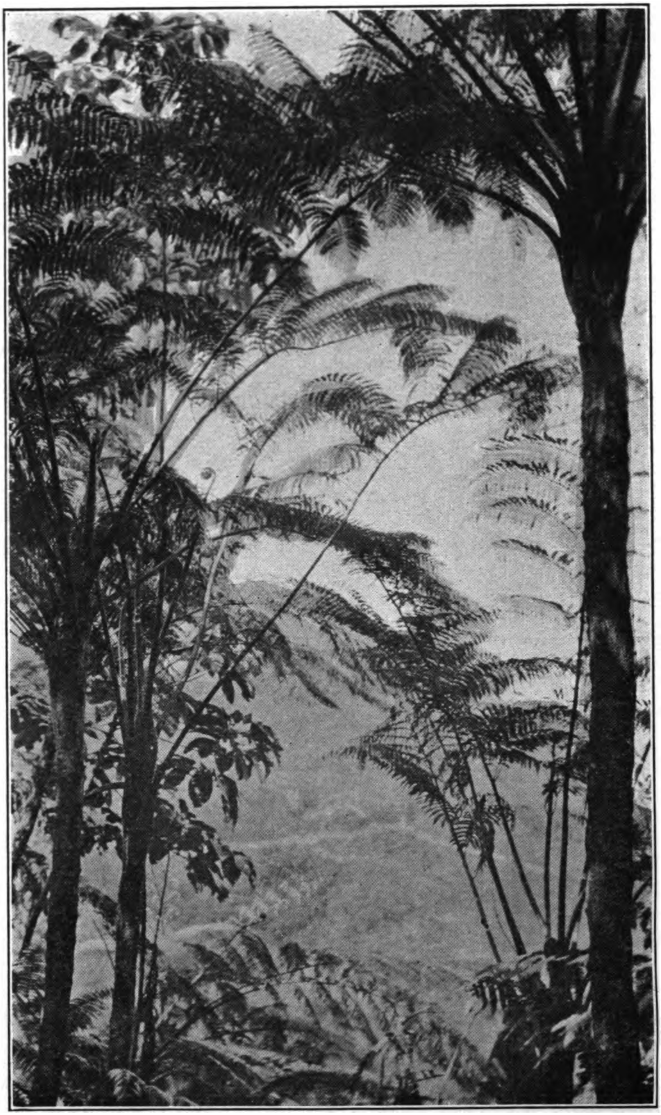
Notes of a naturalist afloat—IV

WILLIAM EDWIN SAFFORD

HISPANIOLA

The republics of Haiti and Santo Domingo are situated on an island remarkable for its beauty and fertility. In reporting its discovery to his sovereigns Columbus enthusiastically declared "la Isla Española es una maravilla." And indeed no fairer vision can be pictured than its high verdure-clad mountains rising abruptly out of the ocean, with here and there a stretch of sandy beach of dazzling whiteness fringed with palm trees, and with luxuriant mangrove thickets bordering its estuaries. Its beauties have been sung by more than one of its own dark-skinned poets; for though the bulk of its population is composed of unlettered negroes, it numbers among its better classes men who have received their education in France, among them several writers of beautiful French prose and verse. The father of France's greatest romance writer, Alexander Dumas, was a Haitian mulatto; and one has only to open the volumes of verse by Tertullien Guilbauld (Feuilles au Vent) and Alcibiade Fleury Battier (Sous les Bambous) to find charming poems, which breathe the soft tropical atmosphere of the beautiful island.

[No. 2 of the JOURNAL (2: 33–64. *pl. 2, 3, portrait*) was issued 11 My 1912.]



Tree fern, Cyathea arborea (L.) J. E. Sm.
Luquillo Mountains, Porto Rico

American Fern Journal

Vol. 2 APRIL, 1912 No 2.

Notes of a naturalist afloat—III

WILLIAM EDWIN SAFFORD

(PLATES 2, 3)

PORTO RICO

The island of Porto Rico is situated in the path of the moisture-laden trade winds. It has an abundant rainfall, yet such is the nature of its topography that the northern part gets more than its share of water while the southern coast is comparatively arid and is covered with xerophytic vegetation.

On my first visit to the island it seemed a vision of paradise as the mists cleared away and revealed the mountains of Luquillo with their silvery, threadlike cascades and the cloud-capped peak of El Yunque rising from their midst. On my second visit, sixteen years later, when I landed on the south coast amid scrubby Cactaceae and other desert plants, it suggested rather a scene from the inferno.

It was on St. Valentine's day, February 14, 1882, after a rough eight days' passage from Norfolk, that we found ourselves a little to the eastward of our reckoning, off the northeastern corner of the island. Our dignified old vessel had taken advantage of the gale to behave in a most frisky and unseemly manner, like a dowager in carnival time. Nearly everybody on board, including the captain, had been seasick and we were all anxious

[No. 1 of the JOURNAL (**2**: 1–32. *pl. 1*) was issued 29 F 1912.]

to get ashore. I remember the apple-green stretches of sugar cane, as we steamed along the north coast back to the entrance of San Juan harbor; the little huts nestling under palm trees along the shore; the schools of flying-fish which scurried out of the way of the pilot boat that came out to meet us, like grasshoppers from the path of a rambler through summer fields; the consequential little Spanish pilot who did not know a word of English, for whom I was obliged to act as interpreter; the venerable Castillo del Morro, guarding the narrow entrance to the landlocked harbor; the swarm of bumboats coming out to sell us "chinas" and "guineos," which we found out to be new names for oranges and bananas; the high, massive walls surrounding the ancient city, founded by Ponce de Leon more than a hundred years before the landing of the Pilgrim Fathers.

I can recall now the peculiar sensation I felt as we entered the city through the great gate; how impressed I was with the fortress of San Cristobal; the narrow, paved streets and the cries of the street venders; the ladies with their black mantillas and their attendant maids or chaperons; the politeness of our barefoot negro guide, who "kissed the feet" of every old colored woman we passed; the glimpses of inner courts, or patios, through the doors of the square whitewashed or blue-washed houses; the delicious black coffee and the white unsalted butter at the hotel; the excursion on the little tramway to the suburban village of Rio Piedras, with its clumps of coconuts and bananas; the Spanish soldiers in the streets; the Spanish players at the theater, who sang fascinating "jotas" and danced graceful "boleras;" the no less fascinating islanders in the cafes and dance halls who sang of "la negra Tomasa," or called their sweethearts "caramelitas de miel," and danced the "Borinquen" to music accented by the scraping of corrugated gourds called "güicharas," or "carachos." But I must refrain: there is not space here to tell of all the novel and interesting features of San Juan, which gave us our first impression of the island and made us realize that we were in a country with customs and etiquette very different from our own.

At the hotel, where I dined with a native Portoriqueño, I heard a discussion of island politics. There seemed, even at that time, to be dissatisfaction with the mother country. I was told that the islanders were overtaxed, the merchants compelled to pay unjust licenses, the lower classes treated like slaves and the better class with disdain. Enormous sums were squandered in keeping the city wall in repair; and nothing had been done toward establishing good roads throughout the island. The cost of the army was enormous. No recruiting among the islanders was permitted, but all soldiers were brought from Spain. The conversation suddenly ceased as a Spanish officer passed our table; but one of the gentlemen added under his breath: "We have the same heart, the same soul as Cuba. Wait! Our time will come some day."

It did come, shortly before my second visit, which was in the summer of 1898. When we landed at the Playa of Ponce we heard how our invading army had been received by the islanders. We had expected resistance; we were met with showers of oranges, bananas, and cigars, and with cries of "vivan los Americanos!" We also heard a pitiful story about the venerable Spanish commander, Colonel San Martin, who found himself deserted by his men and forced to abandon the defense of Ponce. Afterwards we read of his trial and ignominious condemnation by court martial.

At the time of my first visit there was little opportunity for doing any botanical work in the vicinity of San Juan. When we attempted to make an excursion into the interior we found the roads in miserable condition, and our tough diminutive horses sank to their knees at every step. A visit to the Luquillo Mountains, which had appeared so inviting from the sea, was out of the question, and much of the country that was accessible had an exhausted, worn-out look which was disappointing. We crossed the harbor to Cataño, where we found a characteristic mangrove formation, and we explored a short stretch of the seacoast, outside the harbor, where the strand vegetation proved to be very similar to that of the Florida Keys.

In the market of San Juan there were many tropical fruits and other products which were new to us. In addition to oranges, bananas, and mangos, which were introduced on the island after its discovery, there were also fruits which grew there in prehistoric times, and which are mentioned by Oviedo. Among the latter are pineapples (*Ananassa ananas*), the soursop or guanábana (*Annona muricata*), the sugar apple or anon (*Annona squamosa*), the mamey (*Mammea americana*), the tuna or prickly pear (*Opuntia* sp.), pitahaya (*Cereus triangularis*), jagua (*Genipa americana*), the hobo or hog plum (*Spondias lutea*), caymito (*Chrysophyllum cainito*), and the icaco or beach plum (*Chrysobalanus icaco*). Other pre-Columbian products were the yuca or cassava plant (*Manihot manihot*), from which the aborigines made a kind of bread; mani or peanuts (*Arachis hypogaea*); aji or red peppers (*Capsicum annuum* and *C. frutescens*); maize or Indian corn (*Zea mays*); sweet potatoes (*Ipomoea batatas*), which they called "ajes;" yahutias or Carib cabbage (*Xanthosoma violaceum* and *X. sagittaefolium*), which are aroids with starchy roots, allied to the Polynesian taro; and lerenes (*Calathea allouia*), allied to arrowroot. Among other endemic products were tobacco and annatto (*Bixa orellana*), the latter of which was used by the aboriginal Borinqueños to paint their bodies. Yams (*Dioscorea* spp.) were brought to the island from Africa at an early date, in all probability as food for the negro slaves, who took the place of the aboriginal Indians exterminated through the persecution by the Spaniards.

Between my first and second visits I added considerable material from various sources to my notes on island vegetation, and I have amplified them since from herbarium material in the National Museum; chiefly from the collections of Mr. George P. Goll, who accompanied Mr. O. F. Cook and Mr. Guy N. Collins, of the U. S. Department of Agriculture, on their expedition to the island in 1899;* as well as from the report of Professor L. M. Underwood, who, together with Mr. Robert F. Griggs, accompanied them on a second visit in 1901.

Before my second visit, in the summer of 1898, a fine military road had been constructed across the island from San Juan to Ponce. I shall never forget my first drive from the Playa, where we landed, on the south coast of the island, to the city of Ponce. On both sides of the road there were lines of magnificent flamboyant trees (*Poinciana regia*) in full bloom. In some countries these are called fire trees; and the name is well chosen, for their spreading crowns seemed fairly ablaze with clusters of orange-red flowers. The city impressed us favorably, with its clean streets, its shady park, and its Spanish-looking houses with their patios filled with ornamental plants. On a neighboring hillside I saw an interesting collection of fruit trees, among them the genepa or quenipa (*Melicocca bijuga*), a tree belonging to the Soapberry family, with pleasantly flavored egg-shaped, pulpy fruits. Another member of this family introduced from Africa is the akee, *Blighia sapida*. Its pearshaped fruit is red on the outside, three-celled within, with glossy black seeds surrounded by a bright yellow aril. The latter is the part eaten, either stewed, fried, or baked. On the Isle of Pines it is known as "brain food."

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* See Cook, O. F., and Collins, G. N. Economic plants of Porto Rico. Contributions from the U. S. National Herbarium 8: 57–269. 1903.

The limestone region to the westward of Ponce is characterized in many places by scrubby vegetation including cactus thickets. There are also several palmettos, including *Inodes causiarum* Cook, from which the natives make hats, and *Thrinax ponceana* Cook, of which this is the type locality. Near the village of Guayanilla there is a veritable cactus forest including columnar and quadrangular forms of *Cereus*, treelike and prostrate opuntias, and the "melon de costa' '(*Melocactus portoricensis.*) Other xerophytic plants of this region are the aromatic *Amyris balsamifera*, species of *Bumelia*, *Forestiera*, *Zamia*, the troublesome burgrass *Cenchrus tribuloides*, and saltbushes belonging to the genera *Atriplex* and *Salicornia*.

The military road across the island rises gradually from Ponce to Juana Diaz. At this village fine specimens of the Porto Rican royal palm (*Roystonea borinquena* Cook) have been planted, together with the corozo palm of the island (*Acrocomia media* Cook). These palms bear a general resemblance to each other from a distance. Both have a columnar, somewhat bulging stem and a crown of pinnate leaves; but the *Roystonea* leaves have sheathing bases, called "yaguas" by the natives, who often use them for covering their houses; and the *Acrocomia* may be recognized by the needlelike prickles with which its stem is armed.*

Between Juana Diaz and Coamo the roadsides are bordered in places by banks of maidenhair (*Adiantum fragile*) and silver fern (*Ceropteris calomelaena*). Near Coamo, at a resort celebrated for its medicinal springs, many beautiful shrubs and climbers have been planted, including the yellow-flowered *Bignonia unguis;* and in the vicinity grow tamarinds, sapodillas, and other fruits together with the starch-yielding marunguey (*Zamia media*). Near the margins of the springs grow the "culantrillos del pozo," *Adiantum capillus-veneris* and *A. tenerum;* in the neighboring swamp *Acrostichum aureum,* so often found in marshes near the sea; and in the water of ditches, *Ceratopteris deltoidea.*

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* See Cook, O. F. A synopsis of the palms of Puerto Rico. Bull. Torrey Club 28: 526–569. 1901.

Beyond Coamo the road dips down into a deep valley and crosses a little river by a well constructed bridge. It then begins to climb toward the mountain pass of Aibonito, the point where the Spaniards took their stand to resist the American invasion. Magnificent views present themselves one after the other as the road winds about a labyrinth of mountain ridges, with the beautiful blue Caribbean Sea to the southward. Then, after passing beneath a lofty cliff, the mountain pass is reached and beyond it the village of Aibonito.

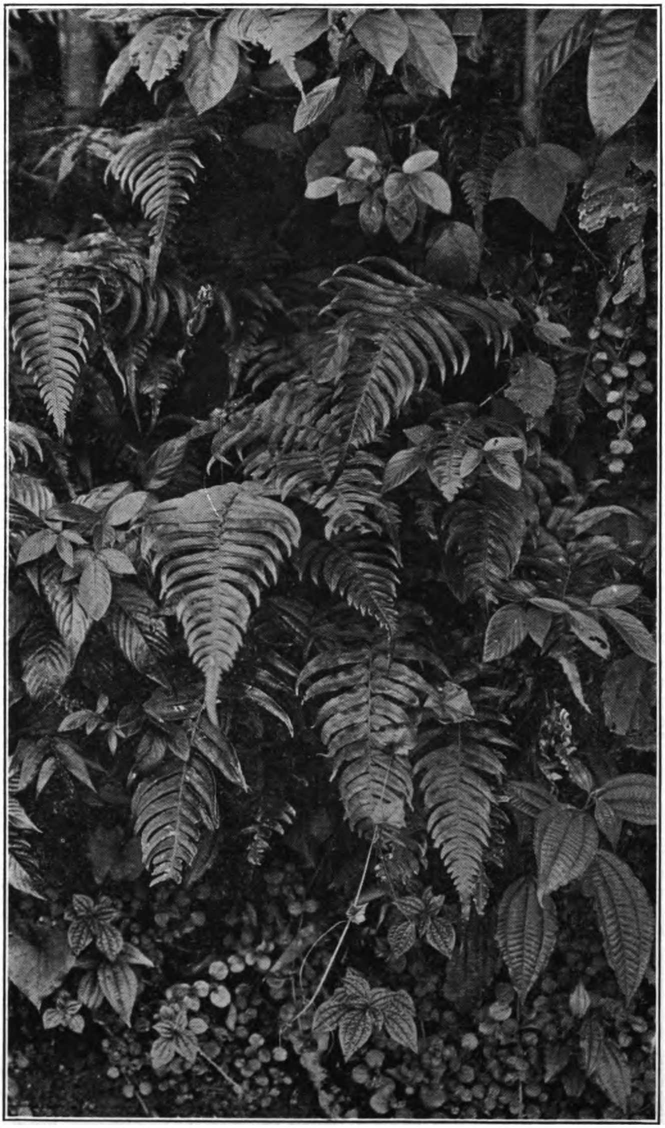
Approaching Cayey, farther on, there occurs a perceptible change in the temperature, owing to the cool moisture-laden breeze which almost continuously sweeps the crests of the hills. This is the main tobacco center of the island. Beautiful tree ferns, *Cyathea arborea,* and dense groves of mountain palms (*Acrista monticola*) make their appearance, together with trees of the genera *Tecoma* and *Tabebuia,* of the Bignonia family, called robles; and a rubiaceous shrub (*Hamelia patens*) called balsamo, with orange-red flowers. Among the ferns of this vicinity are *Dennstaedtia adiantoides, Asplenium dentatum, Polypodium aureum,* and the pretty golden fern, *Ceropteris sulphurea.* From Cayey a branch road leads to Guayama, on the southeast coast of the island, most of the way along a mountain ridge, where there are groves of mountain palms, clumps of tree ferns, rank-growing Heliconias, and among them such ferns as *Polypodium crassifolium* and *Hemionitis palmata,* associated with succulent aroids, Melastomas and Piperaceae. At Guayama there are sugar plantations and many useful plants, including a triangular cactus (*Cereus*), which climbs over walls and bushes and bears edible pitahayas, as large as goose eggs.

Returning to Cayey, the road proceeds northward toward Caguas, shaded in places by trees clothed with epiphytal ferns, and passing numerous clumps of tree ferns, *Cyathea arborea.* At the village of Beatriz occurs an interesting prickly-stemmed climbing fern, *Odontosoria dumosa.* The village of Caguas is composed of houses resembling the aboriginal dwellings of Porto Rico, thatched with palm leaves, and the sides of many of them covered with yaguas or the bases of leaves from the royal palm. Breadfruit trees and taro (*Colocasia esculenta*), here called "yautia malanga," give it a Polynesian aspect. To the westward of Caguas, near Aguas Buenas, are some interesting caves, the openings to which are curtained with tapestry of ferns.

Between Caguas and Rio Piedras, the road is bordered in places with *Cyclopeltis semicordata* and *Asplenium dentatum,* and shortly before reaching Rio Piedras there is a beautiful shady bank covered with *Blechnum occidentale,* associated with succulent Piperaceae, and 3-ribbed Melastomaceae. (See PLATE 3.) At Rio Piedras, formerly the suburban residence of the Spanish governors of Porto Rico, there are many introduced ornamental shrubs and trees.

I have already referred to the mangrove formation at Cataño, across the harbor from San Juan. Here with the mangroves grow the alligator apple (*Annona glabra*), the seaside grape (*Coccolobis uvifera*), and the swamp ferns *Acrostichum aureum* and *Blechnum serrulatum.*

Not far from Cataño, and connected with it by a diminutive narrow-gauge road across the marshes, is the town of Bayamon, now the center of an important orange and grapefruit industry, a very fertile region where



BLECHNUM OCCIDENTALE, MELASTOMACEAE PIPERACEAE, etc.
Roadside bank between Rio Piedras and Caguas
Photograph by Guy N. Collins

tropical fruits of all kinds grow luxuriantly. This place is the home of Dr. Augustin Stahl, the eminent botanist and archeologist of the island, and his accomplished daughter. For some distance to the westward the rich soil continues, offering an inviting field for American enterprise, especially for the cultivation of citrus fruits.

On proceeding along the north coast toward Arecibo, palms of several species are encountered. Near the shore, there are stretches of sand and occasional saline ponds surrounded by desertlike vegetation. Farther inland a series of domelike hills can be seen, which at one time were probably coral islands. These are covered with forest trees, and above the general level of vegetation the crests of palms (*Aeria attenuata* Cook), which from a distance appear to be floating in the air; for their trunks are so slender as to be invisible. This part of the coast recalls the eastern extremity of the island of Cuba, where similar palms can be seen from the sea.

At Arecibo occurs another palm (*Thrincoma alta* Cook) with a remarkably tall and slender trunk, and in the immediate vicinity extensive fields of sugar cane may be seen. From Arecibo a road leads southward to Utuado, offering a succession of magnificent views, as it follows the winding valley of the Rio Grande.* First a limestone region is encountered and the road passes beneath high cliffs crowned with endemic fan palms; then a metamorphic region, where the character of the vegetation changes abruptly; then coffee plantations make their appearance, for this part of the island is the principal center of the coffee industry.

Higher up appear beautiful tree ferns, *Hemitelia horrida,* with short spiny trunks, and *Cyathea arborea,* with trunks sometimes 25 to 30 feet high. This portion of the island offers a most inviting field to the botanist.

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* See Underwood, Lucien M. Report on a trip to Porto Rico. Journ. N. Y. Bot. Garden 2: 166–173. 1901.

Many of the coffee plantations are reached only by mountain trails across ridges and ravines, which yield a rich and varied harvest. At Isolina, westward from Ciales, there is an area of primeval forest, including magnificent specimens of tabanuco trees (*Dacryodes excelsa*), the straight smooth white trunks of which sometimes rise to a height of more than a hundred feet.

Near Utuado the slopes are more or less deforested, but there are beautiful clumps of royal palms (*Roystonea borinquena*) which add grace to the landscape, and in the ravines there are rank growths of ferns, aroids, Piperaceae, and Melastomaceae. Higher up there are groves of mountain palms (*Acrista monticola*), and the limbs and trunks of the hardwood trees are clothed with filmy ferns (*Trichomanes*), *Elaphoglossum*, and epiphytal polypodies. The road from Utuado to Adjuntas, which has been completed since the American occupation, is no less picturesque than that to the northward, with the slopes of the mountains dotted here and there with clumps of Roystoneas and corozo palms (*Acrocomia media*). In the vicinity of Adjuntas there are several wooded mountain peaks with their trees covered with epiphytal ferns. From Adjuntas to Ponce the road passes through coffee plantations, shaded with bananas or introduced Ingas and Erythrinas.* Farther on, the vegetation becomes more xerophytic. The royal palms are replaced by palmettos, and the forest ferns by species of *Notholaena* and *Cheilanthes;* and Cactaceae, Zamias, and scrubby bushes cover the rocky limestone formation.

Along the west coast, which is much drier than the north coast, there are several fine groves of mangos, especially in the vicinity of Cabo Rojo.† At the inter-

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*See Cook, O. F. Shade in coffee culture. U. S. Dept. Agr. Bot. Bull. 25; Agriculture in the tropical islands of the United States. Yearbook U. S. Dept. Agr. 1901: 358. *pl. 43.* 1902.

† See Collins, Guy N. The mango in Porto Rico. U. S. Dept. Agr. Plant Ind. Bull. 28: *pl. 1.* 1903.

esting old town of Mayagüez an Agricultural Experiment Station has been established. Considerable sugar is produced in this vicinity, as well as excellent pineapples; and this is the principal center of the hat-making industry, on account of the groves of palmettos (*Inodes causarum*) which grow here spontaneously. The well known *Carludovica palmata*, from which the so-called Panama hats are made, has been introduced in this region together with many other useful plants. Aguadilla, a port near the northwest corner of the island is connected by roads with coffee plantations in the interior, the most important of which are about San Sebastian; and near Isabel on the north coast, pomelos or grapefruits, said to be the most delicious in the world, are now produced and sent in quantities to foreign markets.

But the forests of the Luquillo Mountains, at the opposite extremity of the north coast of the island, are more interesting to the botanist, and are so important from the conservationist's point of view that they have been made a forest reserve.* Here, between the altitudes of 500 and 2,000 feet occur four of the most important timber trees of the island: the tabanuco, laurel sabino, ausubo, and guaraguao. Of the tabanuco (*Dacryodes excelsa*) I have already spoken in connection with the forest of Isolina. When scarred, its trunk yields an aromatic resin, sometimes called "mountain incense" in the West Indies. The beautiful laurel sabino (*Magnolia splendens*), which yields a handsome hard wood, is called laurel on account of its aromatic properties. The ausubo is a species of *Mimusops* (*M. nitida*), belonging to the sapota family; and the guaraguao (*Guarea trichilioides*), belonging to the mahogany family, is a relative of the Spanish cedar, of which cigar boxes are made. Trees of less importance are the palo colorado, or cedro macho

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*** See Gifford, John C. The Luquillo Forest Reserve, Porto Rico. U. S. Dept. Agr. Forest Bull. 54. 1905.**

(*Hufelandia pendula*), a true laurel; and the leguminous "moca" (*Andira jamaicensis*) with purplish papilionaceous flowers and rounded or elliptical, one-seeded pods, which are much relished by bats. Among the lianas are species of *Philodendron* and *Anthurium*, belonging to the arum family; a wild yam (*Rajania Sintenisii*), and the "bejuco de palma" (*Marcgravia Sintenisii*). There are also succulent Begonias with pink flowers (*B. portoricensis*); Realnemias, allied to the gingers and Alpinas; and a number of Melastomaceae and Piperaceae. One of the most disagreeable features of the region is the occurrence of cutting sedges called cortadero, or razor grass (*Scleria* spp.).*

Above the elevation of 2,000 feet the timber is for the most part stunted and gnarled and clothed with mosses, lycopods, and epiphytal ferns. From the summit of El Yunque, elevated about 3,500 feet above the sealevel, the interior basin appears like a sea of palm crests (*Acrista monticola*), with occasional islands of dark-leaved timber trees.

Among the epiphytal ferns are several species of *Trichomanes*, including the exquisite *T. membranaceum; Hymenophyllum polyanthum* and *H. lineare; Elaphoglossum apodum; Rhipidopteris peltata;* the bird's nest fern (*Asplenium serratum*); *Ophioglossum palmatum;* and several species of *Polypodium*, including *P. serrulatum* and *P. trifurcatum*. Other ferns are *Tectaria plantaginea, T. trifoliata, Dryopteris radicans, Asplenium cuneatum, Adiantum obliquum, A. denticulatum, Polypodium aureum, Danaea nodosa,* and in open places on the mountain slopes *Dicranopteris bifida*. On the margin of a cascade which plunges down the steep slope of Mt. Jimenez, are soft curtains of *Adiantum*, banks of *Dryopteris, Antrophyum,* and *Ceropteris*, and the interesting

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* See Wilson, Percy. Report on a trip to Porto Rico. Journ. N. Y. Bot. Gard. 3: 178, 179. 1902.

Fadyenia prolifera, the fronds of which take root at their tips like our own walking fern.*

But the crowning glory of the Pteridophytes are the tree ferns. Nothing more graceful can be imagined than *Cyathea arborea*, with its slender trunk, its young fronds uncurling at the tips like bishops' crooks, and its lacelike pinnae silhouetted against the sky. The accompanying illustration (PLATE 2, frontispiece), reproduced from a photograph in Dr. John C. Gifford's report on the Luquillo Forest Reserve, will serve to show its beauty better than any possible description. Other tree ferns of these mountains are *Cyathea portoricensis*, the prickly-stemmed *Hemitelia horrida*, and at least two species of *Alsophila*.

I have neglected to mention the caves which occur in various localities on the island. Some of them furnish a supply of bat guano, which has been found to be highly beneficial in fertilizing worn-out sugar fields and other areas exhausted by centuries of cultivation. In these caves various articles of archeological interest have been found. But there is not space here to speak of the vestiges of the aboriginal inhabitants of Porto Rico, some of which, especially objects of stone in the shape of horse collars and peculiar three-pointed stones, are to be classed among the enigmas of archeology.†

As I think of the beautiful island with its tree-clad hills, its picturesque valleys, and smiling fields of sugar cane, I rejoice that it is ours. It is to be hoped that the natives will realize the advantages we have brought them. We have facilitated the means of transportation by constructing roads and railways which will enable them to bring their produce to market; we have created a forest reserve and have taken steps to reclaim extensive denuded areas; we have established an island agricultural station and have introduced many useful plants and trees; and we have established schools for the benefit of rich and poor, and have given the citizens a voice in their own government. Complaints sometimes reach the papers, which point to discontent among the islanders; but these may often be traced to disappointed politicians seeking public office, or to taxpayers who expected all taxation to cease after the American occupation of the island. They now ask for the privilege of United States citizenship or autonomy. It remains for us to convince them that we have the real interests of all the islanders at heart, and that every official act is for the lasting benefit of Porto Rico.

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* See Urban, Ignatius. Symb. Ant. 4. 1903–1911.

† See Fewkes, J. Walter. The aborigines of Porto Rico and neighboring islands. Annual Rep. Bur. Am. Ethnology 25. 1907.

Lycopodium selago from Ohio

LEWIS S. HOPKINS

A short collecting trip was made to Dundee, Tuscarawas Co., Ohio, in the early part of August 1911. While examining the sandstone rocks for *Lycopodium porophilum* Lloyd & Und., which grows here rather plentifully, a plant was found that differs very materially from the typical *L. porophilum.* In fact it was the difference between the two plants which were growing in close proximity to each other that first attracted my attention.

Quite a quantity of the plant was secured, some of which was put in press at once and a part kept green for careful study at a later time. A critical examination of this material shows the plant to have the following characteristics:

Stems rigidly erect, 3–14 cm. high, underground portion very short, with a profusion of roots which form a tangled mass; leaves in more or less irregular zones, yellowish green in color, acuminate or attenuate, hollow at the base; lower leaves, when wilting or drying in press, reflexed; leaves in middle portion of stem spreading;

upper leaves decidedly appressed; foliage leaves from middle portion of stem 7.5–8.5×1.5 mm., entire or very slightly denticulate, middle portion of leaf only very slightly if at all wider than the base; foliage leaves from upper part of stem 4–5×1 mm., entire, and tapering uniformly to the base; sporophylls 4.5–5.2×1–1.3 mm., entire, acuminate, triangular; sporangia reniform and almost hidden by leaves; profusely gemmiparous.

On sandstone rocks at an altitude of about 350 meters.

For the purpose of comparison Lloyd and Underwood's description* of *Lycopodium selago* L. is given:

"Prostrate portion of stem very short, abundantly rooting, soon curving upward and dichotomously branching to form compact tufts (4–17 cm. high.) of vertically placed branches with dense foliage: leaves more or less appressed, or at least upwardly directed, triangular (1.5×4 mm.) to linear-acuminate (0.5 mm.×5 mm.) or aciculate (1 mm.×8 mm.), broadest at the hollow base, gradually tapering to the acuminate apex, entire: sporophylls shorter than the leaves, triangular: sporangia reniform; plant very frequently gemmiparous."

It will be seen, then, by comparison that this plant possesses the three most marked characteristics of *L. selago*, viz, hollow leaves, a mass of roots, and abundant gemmae. To one who sees the plant growing, or collects it for the first time, the abundant gemmae alone, or the mass of tangled roots, will be sufficient to separate it from related species.

Unfortunately the gemmae fall off in drying and it is exceedingly difficult to preserve the roots, so that neither shows its relative value in the accompanying illustration. This was made from a pressed specimen collected Aug. 9, 1911, and now in my herbarium. The illustration fails to show the upright erect habit of the plant, as the stems have been bent out of their proper position to prevent overlapping.

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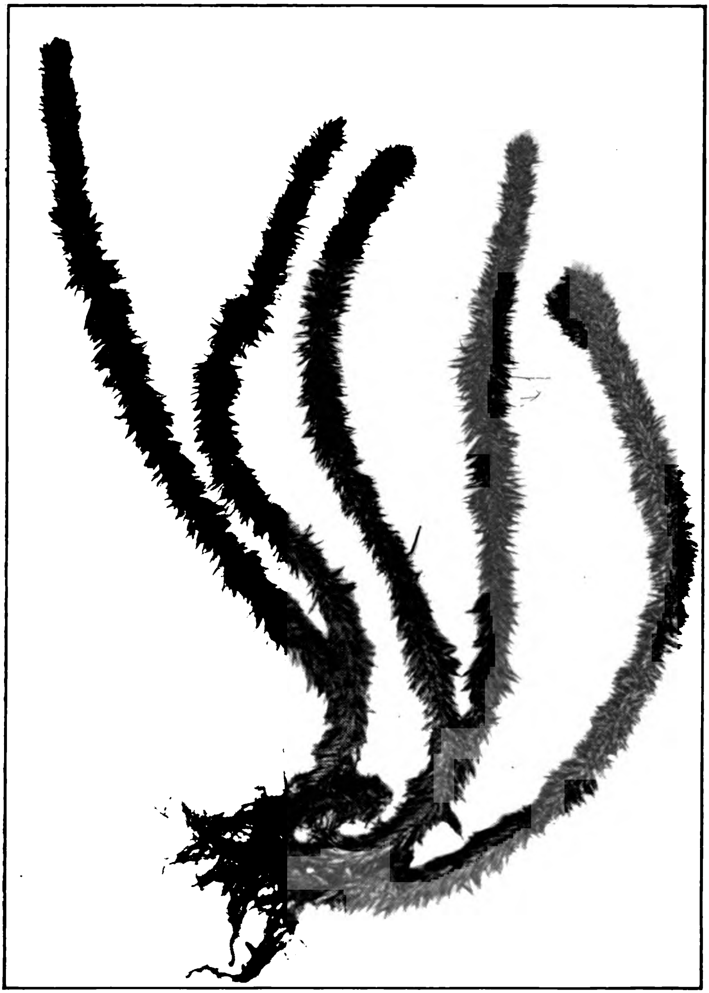
* Bull. Torrey Club. **27**: 149. 1900.



LYCOPODIUM FROM DUNDEE, OHIO
From photograph of herbarium specimen

On account of its intermediate character this plant might be supposed to be a hybrid. Or, it might be considered sufficiently distinct to be described as a new species. However, although it is not typical *Lycopodium selago* L., it is here included in that widely distributed and very variable species, according to the present classification of the genus.

Lloyd and Underwood* give the distribution of *L. selago* as follows: "Greenland, Labrador, Newfoundland, Maine, New Hampshire, Vermont, New York, North Carolina, Idaho, Washington, Alaska, St. George Island (Behring Sea). A plant with strongly reflexed leaves but not otherwise differing from *L. Selago* is represented by specimens as follows:

"IDAHO: Little North Fork Basin . . . . . .
"ALASKA: Sitka . . . .
"CANADA: Mud Lake . . . . "

It occurs also in Pennsylvania as Poyser† says of it: "Rare. Top of a mountain at the Delaware Water Gap in Monroe County. The only record."

PEABODY HIGH SCHOOL,
PITTSBURGH, PA.

Observations on some Lycopodiums of Hartland, Vt.

NANCY DARLING

On Sept. 30, 1908, the author found, near one of the Eshqua Bogs, Hartland, Vt., a thriving ring of *Lycopodium sabinaefolium* Willd., growing in the vicinity of young pines in pasture land, and a few rods away from it a wide strip of the blue-green club moss, *L. tristachyum* Pursh. About a year later the two species were discovered growing together in a spot close to the bog, where numerous hummocks displayed the qualities of the plants to great advantage. Here the ring of *L. sabinaefolium* was probably forty feet in diameter and could be easily distinguished by its leaves, which give it the look of a trailing cedar. Reindeer moss, Polytrichums, and Hypnums were mingled with the club mosses, all being in the partial shade of scattered young maples. In this region *L. tristachyum* is very dense in growth, especially where it is in the open. Its funnel-shaped fans are so heavy as to feel almost leaden in the hand; its color is a deep, glaucous blue-green, and its tiny leaves are so closely appressed as to give the branchlets the appearance of being smooth, or lacking the awl-shaped tips; while, in fruiting, it is prolific, five, six, seven, or eight spikes on one peduncle being not unusual.

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* Loc. cit. 150.
† Poyser, W. A. Fern Bull. 17: 80. Jl 1909.

On July 19, 1910, Mrs. A. B. Morgan and the author, while driving to a nature club meeting at "Fairview," N. Hartland, found a very different form of *L. tristachyum*. The sterile branches of this plant, instead of being funnel-shaped were almost globular, some of them over 14 cm. across, and the branchlets were very narrow, about 1 mm. in width, if leaf tips are excepted. The leaf tips, however, were in some of the branches noticeably spreading, and branches showing this characteristic were looser than the others and tended to form delicate sprays resembling vines. The soil in which this form grows is clay.

Aug. 31, 1910, Mr. P. W. Whiting collected a similar form, in fruit, on Hart Island. All the fertile branches were loose and vinelike, and their peduncles bore two, three, and four spikes, respectively; but some of the branchlets were at least 0.5 mm. wider than those noticed on the N. Hartland plants. The soil of Hart Island is sandy.

Aug. 12, 1911, Mr. J. G. Underwood collected in Spruce

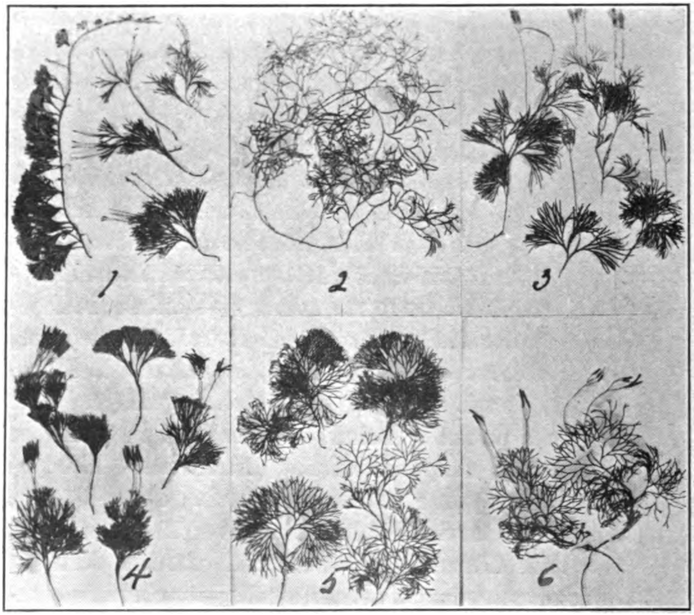
Swamp, on a rocky hill, specimens of a *Lycopodium* whose peduncles bore two, three, and four spikes, similar to those of the Hart Island plants, but whose branches resembled those of *L. complanatum* L. The branchlets were broad and flat, as in the latter species; but the leaf tips were far more spreading, even bristling.

Dr. Ezra Brainerd, of Middlebury, Vt., in 1910, expressed his observation of the apparent mingling of *L. tristachyum* and *L. complanatum* characteristics in specimens from N. Hartland and Hart Island. In the Spruce Swamp form, the crossing of these two species is even more strongly suggested. The soil of Spruce Swamp is, in places, a dry loam, somewhat like that of the Eshqua Bog's outer limits, where the rocks are Conway schists.

Now, the question is, Does *Lycopodium complanatum* L. grow in Hartland? If so, it might cross with *L. tristachyum* Pursh. Mr. W. H. Blanchard has described, in Rhodora for October 1911, a station of it, true to the type, which was discovered May 7, 1910, by Mr. H. G. Rugg, in the Lull Brook valley, near Hartland village. The plants here produce branches that are gracefully diffuse and which are composed of few branchlets. The peduncles bear only one fertile spike each. June 4, 1910, at the base of Garvin Hill, which is over 1800 feet high, the Hartland Nature Club observed another form of *L. complanatum*, some of whose sterile branches are compactly funnelshaped and whose fertile branches resemble those of the Hartland village station. The Garvin Hill plants have peduncles bearing one, two, and three fruiting spikes. Another feature is that the general growth of the running stems takes the form of a ring, as in the case of *L. sabinaefolium.*

Lycopodium tristachyum, then, in Hartland, might cross with *L. complanatum* to produce a hybrid; and as the anomalous forms of *L. tristachyum,* above described, renew their growth from the ends of all the branchlets, just as in the true *L. tristachyum*, but have the divergent leaf tips of *L. complanatum*, it is possible that they are hybrids of these two species.

Lycopodium complanatum L. var. *flabelliforme* Fernald being very abundant in every part of the town, the crossing may be with that rather than with the type.



LYCOPODIUM

FIG. 1. *L. complanatum* L., from Garvin Hill.
2. *L. complanatum* L., from Hartland village.
3. *L. complanatum flabelliforme* Fernald, from Jenneville.
4. *L. tristachyum* Pursh, from Eshqua Bog.
5. *L. tristachyum* Pursh, from North Hartland.
6. *L. tristachyum* Pursh, from Hart Island.

Indeed, the variety *flabelliforme* varies exceedingly in this section. For instance, in Jenneville, there is a spot, by a branch of Lull Brook, where large plants of it,

Yours sincerely
Carl Christensen.
Febr. 1911.

growing under maples and young hemlocks, yield peduncles that support one, two, three, four, five, and six spikes, all aberrant, in that each spike is lengthened into an awllike tip of leaves.

On the crest of Sunset Ridge, "Appledore," is a station where the plants show the same characteristics in fruiting, in addition to having the trailing stems form a distinct ring. In the latter place, there are hummocks lying open to the sun, over which some of the *Lycopodium* runs.

Fern students in Hartland invite special observation of these forms on the part of any and all interested in plant morphology and ecology. Specimens of the different lycopodiums mentioned in this article have been placed in the herbarium of the Hartland Nature Club, and photographs of them have been taken by Mrs. Evaline Darling Morgan.

WOODSTOCK, VT.

Carl Frederik Albert Christensen: some biographical notes

R. C. BENEDICT

(WITH PORTRAIT)

Some years ago, in the winter of 1894–1895, a young Danish student who was preparing to take his master's degree in botany at the University of Copenhagen, had occasion, in order to complete his course requirements, to select and develop a topic relating to some special group of plants. The student, Mr. Christensen, chose to study ferns. From that beginning he has continued his work with these plants until, at the present time, he may well be considered the leading active student of ferns.

His Index Filicum is undoubtedly the most useful fern book ever issued. With its 744 pages, including 23,499 specific names, it bears about the same relation to fern study that a dictionary bears to the study of a foreign language. Since this much needed task was completed, Mr. Christensen has published a number of important monographic papers dealing especially with the genus *Dryopteris*. Three of his shorter papers have appeared in the AMERICAN FERN JOURNAL, and it is with a view of making readers of the JOURNAL better acquainted with Mr. Christensen that the present article is written.

Carl Frederik Albert Christensen was born in a village on the island of Lolland in South Denmark on the 16th of January 1872. His early education was obtained in the elementary and higher schools of the island of Falster. In 1888 he went to a secondary school in Copenhagen to prepare for the entrance "examen" of the University of Copenhagen, which he entered in 1891. Here, for the first year he studied with the intention of following medicine as a profession, but after this he decided to specialize in natural science, particularly botany, which had long been a favorite pursuit of his. His teacher in this subject was Prof. Eugenius Warming. Beside botany, he studied also physics, chemistry, zoology, mineralogy, and geology In 1900 he received the degree of Master of Science from the university. Since then he has worked in the library and museum of the university, and has taught in the secondary schools. The botanical library there is particularly rich in old literature, which was especially necessary during his preparation of the Index.

In October 1900 he was married to Miss Aff Derschen. Since then three daughters have been born.

The selection of ferns for his special study was in Mr. Christensen's case entirely accidental, and yet his choice had in it the same elements that have led most members of the American Fern Society to be interested in these plants. As already noted, he had occasion in the winter of 1894–1895, to choose some group of plants as a "speciale," i. e., one which he had to study so thoroughly that he could be said to know it perfectly. At that time he was engaged in collecting in the field, winter stages of the wild plants of his country. On one excursion, on a cold winter day when the ground was white with snow, he came into a beech forest where he found in the snow some fern leaves which were still quite fresh and green, offering a beautiful contrast to the white snow. He knew at that time scarcely more than a dozen fern species, and the beautiful leaves which he had found seemed entirely unknown to him. He preserved some of the leaves and as he later tried to identify them, he was struck with their beauty: in their beautiful outline and delicate structure, they seemed to him esthetically far to surpass all other plants. He was seized by a veritable *amor sancta* for them, and from that moment his "speciale" was chosen. The particular fern found that day was believed then to be the reputed hybrid *Dryopteris cristata* × *spinulosa,* sometimes identified with the American *D. Boottii* (Tuck.) Underw., but it was probably a form of the true *spinulosa.* It may be noted that here in America reputed crosses between the more evergreen species and those that are less so are usually intermediate in this respect as well as in the other characters of difference between the species.

In preparing these notes, I was interested to learn how Mr. Christensen came to publish his scientific contributions in English. The text of the recent articles in the JOURNAL appeared almost exactly as written, only a few minor changes having been made in the phraseology. Below I quote in very slightly modified form his reply to my request for information.

"We small nations are of course compelled to communicate in a foreign language, as very few foreigners understand Danish. In the higher schools, English together with German, French, and Latin are taught, but at my time English was read only, not written or spoken as in the present secondary schools. As a young student I could read English but scarcely write anything correctly. During my botanical studies, I was compelled almost daily to read English scientific literature, and *peu à peu* I learned the usual combinations, scientific words, etc. I have thus taught myself to write English. . . . Beginning a correspondence with foreign botanists, I tried to write partly in German and partly in English. German is easy for us Danes to speak but very difficult to write correctly because of its difficult grammar. English, on the other hand, difficult for us to speak because of its pronunciation, is far the easiest language for us to write, because its grammar is like our own, very simple, and the position of the words is very like that of Danish. I have therefore chosen English as my language of correspondence, and I now write all my letters, even to Germans, in English. I know very well that my English is bad, but I know also that I can express my thoughts in that language so concisely that I rarely fear to be misunderstood."

Certainly readers of Mr. Christensen's recent papers in the JOURNAL will be ready to affirm the truth of the last statement in the preceding sentence, and we shall all hope to read more of his articles in future numbers of the JOURNAL.

I include below a list of his contributions to fern literature. I am not sure that it is complete, but I believe it is practically so. It is interesting to note that all of the papers deal at least in part with American ferns. The papers are listed in chronological order.

1. New ferns from Brazil. Bot. Tidsskr. **25**: 77–81. 27 D 1902.

2. On the American species of *Leptochilus*, sect. *Bolbitis*. Bot. Tidsskr. **26:** 283–297. *f. 1-8.* 30 N 1904.
3. A new *Elaphoglossum* from Brazil. Bot. Tidsskr. **26:** 299, 300. 30 N 1904.
4. Index Filicum i–lx+1–744. 1905.
5. Revision of the American species of *Dryopteris* of the group of *D. opposita.* 1–90. 1907. (Kgl. Danske Vidensk. Selsk. Skrifter VII. **4:** 247–336.)
6. *Dryopteris* nova brasiliensis. Repert. Sp. Nov. **6:** 380, 381. 1 Mr 1909.
7. On *Stigmatopteris* a new genus of ferns with a review of its species. Bot. Tidsskr. **29:** 291–304. *f. 1-15.* 25 My 1909.
8. The American ferns of the group *Dryopteris opposita* contained in the U. S. National Museum. Smithson. Misc. Coll. **32:** 365–396. 12 Jl 1909.
9. Ueber einige Farne in O. Swartz' Herbarium. Arkiv Bot. **9**^{11}**:** 1–46. *pl. 1-5. f. 1-13.* 22 F 1910.
10. On some species of ferns collected by Dr. Carl Skottsberg in temperate South America. Arkiv Bot. **10**^{2}**:** 1–32. *pl. 1. f. 1-4.* 9 S 1910.
11. On the genus *Dryopteris*. Am. Fern Jour. **1:** 33–37. 13 F 1911.
12. The *Pteridophyta* of the arctic regions. Am. Fern Jour. **1:** 65–70. 3 My 1911.
13. Four new ferns. Repert. Sp. Nov. **9:** 370–372. 10 Je 1911.
14. The tropical American species of *Dryopteris* subgenus *Eudryopteris.* Am. Fern Jour. **1:** 93–97. 7 Au 1911.
15. On a natural classification of the species of *Dryopteris*. Biol. Arbejder Tilegnede E. Warming 73–85. 3 N 1911.

NEW YORK CITY.

Letter to the members of the American Fern Society

ROBERT A. WARE

It is probable that among the first questions that come to the mind of one who finds himself the nominal head of any organization, are those which pertain to the larger usefulness and greater efficiency of that organization. Since a turn in the wheel of fortune has brought me into this new relation with this society, I have been asking myself what can be done to make it more interesting, more profitable, more worth while. Without expecting too much, and yet with a desire to stimulate if I may, the fruitful energies of our society, I venture to offer several suggestions pointing to that desired end.

I believe that it is proper that we should ask ourselves these two questions, viz: What may I expect to gain from the society? What can I do to make the society more interesting and more profitable to all members? The thoughtful consideration of these questions will in itself, I believe, contribute toward realizing the purposes for which the society was organized. And from the beginning it is well to recognize that the society will be what we make it, nothing more, and that much depends upon our answer to the last of these two questions.

Now what are our resources? We have an organization of about 250 members, scattered over the United States and elsewhere, having a common interest and who, it may be assumed, have become members with the belief that something was to be gained thereby. Our membership includes men and women of various attainments, from those who are making botanical science their profession to those whose satisfaction is found in beholding with glad and satisfied eyes the glory and the beauty of the living plant in its natural habitat.

We have a society "Journal" splendidly edited, well printed, creditable in every way, and in which we can all take pride.

We have a society herbarium, instituted through the initiative of the late Alvah A. Eaton and recently, by the commendable efforts of our present energetic curator, put into more available shape for use, from which any member may, by paying the cost of transportation, borrow authoritatively named specimens with which to compare his own.

Finally we have the postal service, making communication easy.

Here, then, are resources at hand sufficient to bring to us individually far more than most of us are at present realizing.

I am disposed to believe that our members generally would welcome a larger intercourse. While no doubt there are those who are so occupied with their professional duties that they would find it difficult to take on additional correspondence, there are, I am convinced, many of our members who would gladly find time in which to satisfy any genuine appeal for help or advice. But it is not the advanced student alone to whom we may look for increased activity. Surely we all know the value of comparing notes with those whose studies and observations, although along similar lines, have yet been different from our own. Such exchange of experiences is both interesting and stimulating. Then, too, most of us enjoy having questions put to us, not that we always answer them offhand, but because we want to answer them, because they set us to thinking and to investigating, and because they give us a keener relish for the subject itself. And then there is always coming into the field a new generation of beginners with their refreshing enthusiasm and eager inquisitiveness, one of the best things in our society. These should be made to feel that they are welcomed into a fellowship whose spirit is one of helpfulness. They should be made to feel, also, that fern students, whether advanced or beginners, need no special introduction to each other, but that our common membership may be counted as sufficient ground for approach, and that any hesitation lest our advances shall not be looked upon with cordiality should be put aside. I would therefore urge those who are not already doing so, to write some of their fellow members, write if only to ask a question and then follow where that step shall lead.

It is to be hoped that, with all proper regard for the preservation of the wild plants, you are forming an herbarium. This contributes to one's cumulative knowledge and serves as a valuable record of what he has accomplished and as a basis for further study. Here again is a channel through which you can work to your own and others' advantage. Offer the plants of your region, or any surplus you may have from elsewhere, to another, in exchange for those he may be able to send you. We are sometimes inclined to say that only the common species grow in our neighborhood and that no one wants them. Perhaps we need to be reminded that the "common" species of one region may be uncommon or rare or even entirely absent in another region. Moreover, one who aspires to a broad outlook over the fern world is not satisfied with the fact that the several species are represented in his herbarium; he aims to show their range, together with variation due to soil, climate, local environment, and other conditions, and therefore wants examples of the species from many different regions. Occasionally we learn of one who is making a special study of a single genus or species. Such a student finds it necessary to examine a great many plants of that group, and you can help him by sending him material. So I repeat: write, put your questions, offer your duplicate plants; and if your experience proves to be anything like mine, you will get help and a lot more besides.

As to the JOURNAL, although we have an able editor we should not let him carry the burden alone. It is safe to say that he welcomes contributions not only of a technical, somewhat ponderous character, but others as well in lighter vein, short, pointed, crisp notes, and the simple reports of observations in the field or elsewhere. Such as these we all enjoy, for they give life and zest to a periodical and are much to be desired. The things that have interested you are likely to interest others, and one need not be a skillful writer to tell of the things which have interested him, nor should he wait for the time when he may write a fine "article." We want the variety which results from many contributors. Furthermore, this society, because of its widely scattered membership, lacks an advantage possessed by many organizations, in that it is unable to get its members together in any considerable numbers for acquaintance and discussion. This emphasizes the desirability both of making more use of the JOURNAL as a medium of interchange, and of the development of individual correspondence. I wish that we might have a discussion of these very points in the pages of the JOURNAL. Send in your questions to the editor. He will answer them, and he may find some of them of sufficient general interest to warrant their publication, together with his answers or comments. Here is a way in which both expert and novice can help.

It should not be forgotten that the society herbarium will be increased in value to the extent that it is made to contain the various species in large numbers. Here is another way in which you can help, by sending ample material, even of the common species from your region. When you are collecting for yourself have the society herbarium in mind and collect for that also. Send the plants to the curator, who will welcome and acknowledge them. If it is convenient for you to send them well mounted on standard herbarium sheets it will be so much more a help, but that is not necessary. And if you cannot send many, send a few.

Finally, you can help by giving to the officers your criticisms and your suggestions for making the society more helpful. Therefore, do not hesitate to express your sentiments.

By the foregoing it will be seen that I am more inclined to suggest ways in which one can contribute to the general good than direct ways in which he can secure benefits. The truth is, I believe the second is more than likely to be wrapped up in the first, and that he who is disposed to consider ways in which he can be useful will soon find himself gaining as much as, if not more than, he is giving. This is probably no less true in this matter than in most affairs of life.

It will be very gratifying to note an increased utilization of the excellent resources we have at our command. I hope that there are those who will be stimulated to greater activity through some suggestion found herein, and that all of us will experience more satisfaction than can possibly come from simply seeing our names on the list of members and in paying our annual dues.

BOSTON, MASS.

Some hybrid ferns in Connecticut

E. J. WINSLOW

During the past three years I have received from Mr. H. C. Bigelow, of New Britain, Conn., several packages of ferns collected by him in central Connecticut, including many hybrids of *Dryopteris*. A brief, generalized record of these follows:*

Dryopteris Clintoniana × *Goldiana* Dowell. Plainville, 1909. [Nov. 1, 1911.]

D. Clintoniana × *intermedia* Dowell. Several collections, Plainville and Southington.

[*D. Clintoniana* × *spinulosa* Benedict. Southington, July 1911; Plainvllle, Nov. 1, 1911.]

D. cristata × *Goldiana* Benedict, Plainville, July 1909.

D. cristata × *marginalis* Davenp. Several collections from New Britain, Berlin, Bristol, Cromwell, Manchester, and Plainville. This hybrid was found to be surprisingly common in a piece of woods near Windsor by the Fern Society members who attended the Hartford meeting last June.

D. cristata × *spinulosa* (Milde) C. Chr. Plainville, July 1909. [Southington, July 1911.]

D. intermedia × *marginalis* Benedict. A fine, well fruited, and very convincing specimen, Manchester, September 1911.

There are collections of *D. cristata* × *intermedia* Dowell (*D. Boottii*) from all these localities.

In July 1910 I found one good plant of the rare hybrid *D. Goldiana* × *intermedia* Dowell at the edge of the town of Irasburgh, Vt., near the village of Orleans.

AUBURNDALE, MASS.

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* [Some additions, in brackets, have been made by the editor, to whom Mr. Bigelow has submitted a number of specimens for identification or verification.—PH.D.]

Notes and news

Action has been delayed on the Sundry Civil Bill, and the appropriations allowed for scientific work are inadequate for a natural growth of our scientific institutions, resulting in a reduction instead of an increase in the staff of scientific workers. This is an unfortunate backward step in the line of scientific progress, the value of which the average politician does not see, especially at the time of exciting political conventions.

From Torreya we learn that Dr. Edgar W. Olive, professor of botany at the State College of South Dakota and state botanist, has been appointed curator at the Brooklyn Botanic Garden. He is to have charge of the department of public instruction and of the work in plant pathology.

The Rev. S. M. Newman, of Hagerstown, Md., has been elected president of Howard University, Washington, D. C.

Dr. A. J. Grout, editor of the Bryologist, is spending his summer vacation at Newfane, Vt., where he is making good use of his camera and studying nature at first hand.

Dr. O. E. Jennings of the Carnegie Museum is making a collecting trip in Canada in the interests of the museum.

Our secretary, Prof. L. S. Hopkins, is again spending a part of his summer vacation at Wooster, Ohio.

Mr. H. G. Rugg, our treasurer, is spending a part of the summer in the vicinity of Proctorsville, Vt.

A question box has been suggested by several members of the American Fern Society, but thus far no questions have been sent in. Will those who suggest a question box for the JOURNAL kindly make a beginning by sending in questions or suggestions to the editor?

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PHILIP DOWELL, Editor

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CONTENTS

Notes of a naturalist afloat—V . . William Edwin Safford 97
Roughing it to the Yosemite . . . . H. Harwood Tracy 107
Further notes on the fern flora of Ohio Lewis S. Hopkins 115
Outings for Onondaga moonwort and slender cliffbrake H. E. Ransier 119
Whittier's herbarium . . . . Harold Goddard Rugg 121
A suggestion on the field study of ferns . Philip Dowell 123
Notes and News 124
Index to Volume 2 125

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